AMERICAN JOURNAL OF PHARMACY

PUBLISHED MONTHLY BY THE

Philadelphia College of Pharmacy

Vol. 90 SEPTEMBER, 1918

CONTENTS

Price, $3.00 per Annum, in advance. Issued by Subscription only.
48 pages. Single Numbers, 30 Cents. Back Numbers

Address all communications:
For the Editor: To Alumni Journal of
For the Business Manager: To Harold J.
Publication Office:

American Journal of Pharmacy

ESTABLISHED IN 1825

Four preliminary numbers were published at different times until in 1829, when the publication of the regular volumes began. Since then the publication has been uninterrupted. During the period from 1829 to 1852 four numbers were published annually, except in 1847, when five numbers were published. From 1853 to 1879 six numbers were published. Since this time twelve numbers have been published annually.

MANUSCRIPTS should be sent to the Editor. It should be stated in this connection that the Editor does not assume any responsibility in connection with the views or investigations of contributors, other than to exercise general care in the selection of matter.

Contributors are allowed a reasonable number of copies of this JOURNAL, free of charge, if applied for when the proof is returned.

REPRINTS, if desired, must be applied for when the proof is returned. The table below shows the *approximate* cost of reprints, the make-up of the pages to be identically the same as in the JOURNAL. The actual cost may vary from the figures given, and will depend upon the amount of presswork, paper, binding, etc. Reprints containing half-tones may be expected to cost somewhat more than the rates given.

	2 pp.	4 pp.	8 pp.	16 pp.	COVERS WITH TITLES	
25 copies	$2.25	$3.75	$7.75	$9.00	25 copies	$1.75
50 "	2.50	4.00	8.25	9.75	50 "	2.00
100 "	2.75	4.25	9.00	10.75	100 "	2.25
250 "	3.75	4.75	10.00	12.00	250 "	2.75

THE AMERICAN
JOURNAL OF PHARMACY

SEPTEMBER, 1918

EDITORIAL.

THE PASSING OF THE PHARMACEUTICAL CALENDAR.

Meetings of many of the state associations for the calendar year 1918 have already been held and the recent meeting of the American Pharmaceutical Association marks another of the series of red-letter days on the pharmaceutical calendar. It is assumed that the records of accomplishments of the meetings of the various pharmaceutical associations for this year are fully up to the average and it is hoped that the results of these meetings may prove to be permanent benefits to pharmacy.

Presumably, there was some public need that called into existence every one of the pharmaceutical organizations in the United States and that such need of organization and of service was a more or less permanent one and the value of each association will be dependent upon the success attending its efforts to carry out the purposes of its organization.

At the Chicago meeting of the American Pharmaceutical Association, the question of a federation of all the pharmaceutical associations into one grand organization was discussed at a meeting of delegates representing the more important pharmaceutical and drug trade organizations. It was apparent that these represented many interests more or less diverse and incongruous. While in many matters of national importance their interests were in common, other subjects were of peculiar and particular consequence perhaps to only one of the organizations or trade interests.

The deliberations resulted in a conclusion to test out more fully the plan of coöperation on matters of universal interest to Pharmacy through the National Drug Trade Conference. The wisdom of this conclusion will probably be demonstrated and the germ of the fed-

eration idea, *intensified coöperation* on such matters of common interest, can be developed in this way. We are pleased to note that one of the decisions of the Drug Trade Conference was to get back of the movement to have a pharmaceutical corps established in the United States Army.

G. M. B.

THE STANDARDIZATION OF PHARMACY.

From time to time, arguments have appeared in pharmaceutical journals advocating that drug stores should be classified and that a differentiation should be made between those proprietors of drug stores that have established a professional standing as pharmacists and others who have devoted their efforts mainly to merchandising and the upbuilding of mercantile ratings.

The present trend of pharmaceutical thought is toward a classification by which the compounding of prescriptions and the dealings in potent medicaments shall be restricted to professionally educated pharmacists and the merchandising of the numerous commodities, very largely side lines, commonly sold in drug stores shall be left to another class of merchants who have not the necessary qualifications and education of the pharmacists. In many of the European countries such a method has been in vogue and the pharmacist or apothecary holds a distinctive position above that of the drug-store keeper and many other merchants.

A short time ago, it was seriously proposed that there should be established a class of "certified pharmacists." The questions naturally arose who was to have the authority for the certification and what should be the appropriate rules and regulations for such standardization? Pharmacists would not be willing to delegate such control and authority to a medical organization or to a politically appointed board and as no definite standard was available and the authority for such action was not vested in any body pharmaceutic, this project remained as an undeveloped proposal.

At the recent meeting of the Conference of Pharmaceutical Faculties, the President, Professor Henry Kraemer, took a pronounced stand in favor of the classification of dealers in drugs into two classes, the pharmacists or apothecaries and the druggists.

As a basic proposition, thoughtful pharmacists already have

given consideration to this as a possible necessity to which they could willingly subscribe. The standard, however, that he proposes for such a differentiation would be a very misleading gauge whose results would be so fallacious as to entirely destroy the purpose of the proposer. While decrying commercialism, a commercial basis, nevertheless, is proposed to differentiate between the professional and the commercial drug dealers. The volume of business done and "a minimum compounding of prescriptions," "in which at least four thousand prescriptions are compounded within one year," would be very misleading criteria by which to determine the educational and professional qualifications of pharmacists. It not infrequently happens that the most capable pharmacists, professionally educated and thoroughly equipped, do not enjoy the largest patronage.

The successful pharmacist has to meet the requirements of his environment and supply the needs of the community in which his business is located. A young pharmacist who has had the advantage of a good preceptor and excellent store experience and who has graduated with honor from the college of pharmacy and readily passed the examination of the state board, engages in business in a very promising location. Filled with high ideals and a laudable ambition to excel in his profession, he takes pride in his model modern equipment for prescription compounding. His education, ability, skill and facilities all justify his expectations for a successful business career. After several years of close application to business, through no fault of his own, he is confronted with altered conditions beyond his control. A change has taken place in the character of the residents of his neighborhood. The old family homesteads may have become tenements filled with foreign born population or the encroachment of business may have converted the locality into a business thoroughfare with only transient trade or perhaps the locality may have become a "factory district." Moreover, the physicians in the neighborhood have ceased to write prescriptions and are now dispensing ready made medicines from their offices. Thus, by these urban changes and the unethical practice of medicine, fate decrees that to be successful in his business, he must adjust his professional ideals and aspirations to the changed conditions of his environment.

We fail to understand how the Boards of Pharmacy in such cases could give relief nor can we see how "the Boards of Pharmacy could make a ruling which would either *enable them to in-*

crease their professional work or cause them to see that the responsibility required for this did not give them an adequate remuneration for their pains" (italics mine).

The knowledge, equipment, skill and ideals have not been eradicated, but measured now by the yardstick proposed by the professor our model could no longer be classed as a pharmacist. Public sentiment and the laws of the land will have to be changed before such a standard for pharmacists as that proposed can be given serious consideration.

Much of the talk about "who are the pharmacists" and "what constitutes the professional work of the pharmacist," is twaddle. Our model pharmacist is performing just as useful service and as much a professional duty when he sells a nursing bottle or infant food as when he compounds a prescription for the baby and his advice to the young mother on these may be of greater benefit to the baby than the medicine. Many of the non-medicinal commodities supplied by the apothecaries have always been looked upon by the public as public necessities coming within the line of his purveying and in supplying these pharmacists are only fulfilling their legitimate purpose in the present status of society.

While admiring the attainments and the zeal and devotion to the cause of professional elevation of pharmacy of many of the members of the Conference we cannot refrain from calling attention to inconsistencies and radicalism that would defeat the very purpose for which they are striving. Their pedagogic ideals and the rarified esthetic atmosphere in which they live and the personal hobbies ridden, leads them to expect that a pharmacist must measure up to their ideals. To one research in pure science is indicative of professional standing as a pharmacist to another application to study along strictly laboratory work or clinical analysis would appeal as the essential. Their lack of acquaintance with the problems that confront the practical practicing pharmacist is too often too apparent and their limited actual experience under the strenuous conditions now confronting the apothecary all tend to make them hardly a safe guide to follow implicitly in matters outside of their special educational branch.

The second proposition submitted in this presidential address, namely, that the conference take measures to provide for the organization and conduct of two classes of colleges, the Colleges of Druggists and the Colleges of Pharmacy, will likewise merit careful

consideration as to its feasibility. Who shall determine the lines of demarcation? The assumption on the part of the university faculties that they alone represent professional pharmacy is pure assumption. Unfortunate indeed would be the attempt on the part of these interests to differentiate between schools of pharmacy and to establish as a standard for a college of pharmacy affiliation with a university.

A common pedagogic error is for the teacher to imagine that he is the creator of the finished product. All that he can do is to lay an educational foundation and then the application, the ambition and the innate ability of the individual determines the success of his future career and his professional standing.

The teaching ability of the faculty, the equipment of the college and its facilities for imparting collegiate instruction in pharmacy in course and for post graduate study are better criteria, than mere association or affiliation with a university, for determining the feasibility of its giving higher pharmaceutical education.

The judgment of the teacher may be perverted by his zeal and ardor for a new order of things, but an opinion based upon experience and the established records of accomplishments is far safer to determine the practicability of any proposition. The lives of many of those to whom we have accorded honor as the past and present leaders in American pharmacy and as the foremost teachers in our schools of pharmacy are worthy of careful study in this respect. Moreover, many of those to-day sitting in the foremost rank of pharmacy are living examples of the possibility for study, for research and for self-development afforded by a college of pharmacy not associated at any time with a university.

This address is well worth the most careful perusal and study of every pharmacist and druggist and without at all minimizing the importance of the subjects treated therein, the writer would suggest that after this has been done that each reread that logical pharmaceutic classic by Dr. James H. Beal, "Facing the Facts."

Above all, let those who are striving for the true advancement of pharmacy, its evolution and elevation on an appropriate basis, fully recognize that too radical movements cannot succeed and that we are inhabitants of the Earth in an age of practical usefulness and that pharmacy will be gauged by the public in accordance with its fulfillment of its assigned field in the social economy.

G. M. B.

THE DANGER OF INCOMPETENT DISPENSING IN THE ARMY.

The mistake that occurred in an English Army camp hospital, by which a soldier was given carbolic acid in place of quinine mixture with a fatal result, demonstrates forcefully the danger to which the soldiers of Great Britain and the United States are subjected to by the lack of pharmaceutical corps and competent dispensers in the hospitals and encampments of these armies. The following account of the inquest in this case is copied from the *Pharmaceutical Journal and Pharmacist.*

Inquest.

Carbolic Acid: Dispensing in a Camp Hospital.—At an inquest on Cadet Alexander Miller, R.A.F., before the South Bucks Coroner, on July 5, the evidence showed that death was caused by carbolic acid poisoning, the acid having been given in mistake for quinine mixture. The deceased was a patient in the camp hospital, and the fatal dose was given to him by another cadet, a voluntary worker in the hospital. Another voluntary worker, a lady, explained that she got the carbolic acid from the corporal at the dispensary in a sauce-bottle labelled "Quinine Mixture." The corporal deposed that the lady, whom he took to be a nurse, did not say what she wanted the carbolic acid for, but he inferred it was for cleaning or disinfecting purposes. He did not think about a poison label, being very busy at the time, and used the sauce bottle because bottles were very scarce. The jury, in returning a verdict of "death by misadventure" added that the corporal was very much to blame in not seeing that the bottle was labelled poison. In future they considered it essential that the camp should have a qualified dispenser. The coroner, who emphatically concurred in this recommendation, continued: "You know as well as I do that there are properly qualified chemists in the Army who are pushing barrows about, and that sort of thing, whereas they might be most usefully employed in their own important work."

The attention of those responsible for the lack of proper pharmaceutical service in our army, especially the Medical Department of the United States Army, is respectfully directed to this incident.

G. M. B.

"CHLORAMINE" ANTISEPTICS.[1]

By E. Fullerton Cook, Ph.M.

The wide-spread interest manifested by surgeons in army, hospital, and domestic practice, also by dentists, in the new antiseptics, known under the general name of "chloramines" would seem to justify a brief review of their present status.

These substances were originally proposed by Dr. H. D. Dakin[2] in 1915, and have since been extensively tested and improved.

The successful use of the various hypochlorite solutions in the treatment of war wounds, especially the famous Dakin-Carrel Solution, a neutral solution containing from 0.4 to 0.5 per cent. of sodium hypochlorite, resulted in a careful study of many of the phenomena observed with the result that several newer products have been developed, which seem to embody the advantages of this solution, but, in large measure, overcome its defects.

The primary objection to the Dakin-Carrel Solution was the necessity of maintaining this very unstable solution exactly within the strength limits mentioned. If stronger than 0.5 per cent., it became actively irritating, if weaker than 0.4 per cent., it no longer possessed active germicidal power. Then the small amount of active ingredient was soon exhausted in performing its desired function, and this required its constant renewal, elaborate apparatus, and much attention to insure results.

Furthermore, it was found that the skin surfaces about the wound, if allowed to come in contact with the solution, soon developed an annoying irritation, resembling ivy-poisoning, a condition persisting for months, while the solution in contact with the wound was apparently non-irritating if kept within the proper strength.

The investigation of Dr. Dakin and his collaborators led to the discovery that the hypochlorites apparently acted upon the proteins and other nitrogenous cell constituents with the development of chloramines, and these were non-irritating, but highly antiseptic.

The next step was an attempt to prepare suitable chloramines synthetically and the first practical substance discovered was the water-soluble para-toluene-sodium-sulphonchloramine ($CH_3 \cdot C_3H_4 \cdot$

[1] Presented at the meeting of the New Jersey Pharmaceutical Association, Spring Lake, June, 1918.

[2] *Brit. Med. Jour.*, August 25, 1915.

$SO_2Na\ NCl + 3H_2O$), for which the names *Chloramine, Chloramine T* (T standing for toluene), or *Chlorazene,* the latter a trade-marked name in this country, were variously used.

It was claimed for this substance that its solutions could be used in from ¼ to 4 per cent. strength without irritation, the 1 to 2 per cent. solutions being most largely used for wounds and the weaker solutions for nose and throat antisepsis, or for eye work.

In wound dressing, this solution required less frequent changing of the dressings as compared with the Dakin-Carrel Solution, was relatively permanent, and caused little or no irritation.

This substance has also been used in what is known as *Chloramine T Paste,* as suggested by Daufresne, in which 0.7 to 1 per cent. of Chloramine T is dissolved in a 7.5 per cent. paste of sodium stearate in distilled water. This product has proven to be very unstable and is not extensively used to-day.

It has long been recognized, however, that aqueous solutions are not entirely satisfactory for wound dressings, since they quickly dry and are difficult and painful to remove when new dressings are required, and in nasal and throat work are not sufficiently penetrating so that search was made for a chloramine which would be soluble in an oily solvent, which could be safely applied directly to wounds.

This was found in a closely related product, namely, para-toluene-sulphon-dichloramine, for which the title of *Dichloramine T* ($CH_3 \cdot C_6H_4 \cdot SO_2NCl_2$) was adopted without any trade-mark rights being allowed. This product is now manufactured in this country by a number of chemical firms and is recognized and standardized by the New and Non-official Remedies.

The first largely used solvent for dichloramine T was chlorinated eucalyptol, prepared by treating the official eucalyptol with chlorine and carefully neutralizing and drying the resulting product. As first prepared, Dr. Dakin recommended the chlorination to be accomplished by adding potassium chlorate and hydrochloric acid directly to the eucalyptol and, after twelve hours, removing all traces of acid and free chlorine by suitable treatment and subsequently drying by shaking with calcium chloride. Liquid petrolatum was chlorination in a similar manner and was used as a diluent for the concentrated eucalyptol solution of dichloramine T, the dilution being made just before applying to the wound.

Another form of chlorinated eucalyptol was later developed

known as "chlorinated eucalyptol 1.2." This was prepared by passing dry chlorine into eucalyptol until the specific gravity became 1.2 and the viscosity greatly increased.

It was the usual custom to prepare 10 per cent. solutions of dichloramine T in the prepared eucalyptol and diluting only when required and if kept absolutely dry and in amber colored bottles, protected from the light, they remained undecomposed for a month or even longer, under favorable conditions.

If, however, this solution was placed in a damp bottle or exposed, even for a short time, to the light, rapid decomposition resulted, a precipitate of para-toluene-sulphonamide formed, free chlorine was liberated, and the solution became intensely irritating.

Even under the most favorable conditions of freedom from moisture and light, the dilution quickly decomposed so that the surgeon was advised to never use the dilute solution after twenty-four hours and to then carefully wash out all traces of the old solution from atomizer and graduates with the use of chloroform or carbon tetrachloride.

These earlier solvents having proven so difficult to handle and their solutions so unstable, Dr. Dakin again endeavored to correct the defects through many experiments and has now proposed a much more satisfactory solvent and one, fortunately, which is less costly. This substance is known under the title *Chlorocosane,* a title which is not trade-marked and is being used by all manufacturers.

This substance is prepared by passing chlorine into melted paraffin, carefully maintaining the temperature between 125° and 140° C., until the product has increased from 45 to 55 per cent. in weight, when it is shaken with sodium carbonate, to neutralize the hydrochloric acid which has developed, and is afterwards filtered.

The name of this product is derived from the fact that paraffin belongs to the open-chain series of hydrocarbons, this member of the series showing twenty or more carbon radicals and that in this compound, a portion of the hydrogen is replaced by chlorine. The analyzed name therefore shows the "ane," the ending adopted for hydrocarbons of the open-chain series, the "cos" meaning twenty, and the "chlor" indicating the chlorination.

In this solvent the dichloramine T is quite stable, if kept dry and unexposed to light and out of contact with metals. In preparing the solution, which is usually used in 5 per cent. strength for wounds

and in 1 to 2 per cent. for nasal and throat treatment, the dichloramine T is usually dissolved in about one-fourth of the solvent with the aid of heat, and then quickly cooled by adding the remainder of the chlorocosane.

In applying any of the solutions of dichloramine T very light and open dressings are used and all metallic apparatus must be avoided. The solution is preferably sprayed upon the wound from an all-glass atomizer and this is particularly worthy of adoption because of its economy since only small quantities of the antiseptic are required.

A great advantage of this material is the fact that the dressings do not necessitate changing more often than once in twenty-four hours due to the slow liberation of chlorine which continues over an extended period.

Another closely related product which has been placed upon the market is the para-sulphone-dichloramine benzoic acid, known to the trade as halazone ($C_6H_4(SO_2NCl_2)COOH$). This substance is used for sterilizing drinking water in the proportion of 1 part to about 300,000 parts of water, and complete destruction of all organisms results within about sixty minutes.

It is sold in tablets and each of these, containing about 1/8 grain of halazone combined with a small amount of sodium carbonate and sodium chloride, will quickly destroy all organisms in 1 liter of water and render it safe for drinking purposes.

All of these products may be assayed by the well known method used for chlorine products, using a tenth-normal sodium thiosulphate volumetric solution, 10 per cent. potassium iodide solution, and diluted acetic or hydrochloric acid and calculating for the indicated per cent. of chlorine.

In their development and demonstration of usefulness, credit is due Dr. Dakin and many collaborators, chief among whom were Drs. E. K. Dunham, J. B. Cohen, of the University of Leeds, J. Kenyon, of the British Medical Research Committee, Capt. W. E. Lee, Capt. W. H. Furness, Capt. J. E. Sweet, of the United States Army Base Hospital No. 10, and others.

List of Exhibits.—Tablets of Chloramine T (Chlorazene), powdered Dichloramine T, chlorinated Petrolatum, chlorinated Eucalyptol, 10 per cent. solution of Dichloramine T in chlorinated eucalyptol (fresh), 10 per cent. solution of Dichloramine T in chlorinated eucalyptol (decomposed), Chlorcosane. All-glass atomizer devised

for spraying oily solutions of Dichloramine T. (Made by Randall-Faichney Co., Boston, Mass.)

VARIATIONS IN NUX VOMICA AND ITS PREPARATIONS.[1]

By Hugo H. Schaefer.

One of the more important changes in the U. S. P. IX as compared to the former revision is that of the alkaloidal requirement for nux vomica and its assay process. The former requirement called for 1.25 per cent. strychnine and in its determination the well-known assay process was used in which the total alkaloids are extracted, the brucine destroyed, by means of nitric acid and the remaining alkaloid calculated as strychnine. In the U. S. P. IX the requirements are for 2.5 per cent. total alkaloids and the assay process is of course based on the simple extraction and titrating of all the alkaloids of nux vomica.

It was found by the author that a greater percentage of samples of nux vomica met the requirements of the new pharmacopœia than that of the old. In other words that 2.5 per cent. total alkaloids was a lower standard than 1.25 per cent. strychnine. In order to definitely determine this question a number of samples of powdered nux vomica were taken and assayed according to the U. S. P. IX for total alkaloids. After titrating the latter the solution was made alkaline with ammonia water, completely shaken out with chloroform, the latter evaporated and the residue taken up with 15 mils of 3 per cent. sulphuric acid. This solution was now treated with nitric acid to destroy the brucine and the assay completed as described in the U. S. P. VIII, for the determination of strychnine. This data so obtained gave the total alkaloidal content, the percentage of brucine and that of strychnine in nux vomica, it being taken for granted that the other alkaloids present appear in so small a quantity as to justify their not being considered. The results obtained were as follows:

[1] Presented at the meeting of the New Jersey Pharmaceutical Association, Spring Lake, N. J., June, 1918.

POWDERED NUX VOMICA: U. S. P. VIII = 1.25 per cent. strychnine.
U. S. P. IX = 2.5 per cent. total alkaloids.

Sample.	Total Alkaloid Method U. S. P. IX.	Strychnine Method U. S. P. VIII.	Brucine by Difference.
A	2.64	.88	1.76
B	2.93	1.32	1.61
C	2.52	.73	1.79
D	1.92	.73	1.19
E	2.97	1.54	1.43
F	3.21	1.25	1.96
G	2.71	1.30	1.41
H	3.53	1.30	2.23
I	2.38	1.26	1.12

A number of interesting points may be obtained by studying these results. Of the nine samples all but two would come up to the requirements of the U. S. P. IX while three would not meet those of the U. S. P. VIII. Samples A and C would pass U. S. P. IX but not U. S. P. VIII. Sample D would pass neither the old nor the new requirements while sample I would pass the U. S. P. VIII and not IX. There, therefore, seems to be absolutely no relation between the percentage of total alkaloid and that of strychnine. The percentage of strychnine in the total alkaloid varies from 33 to 53 per cent.

Samples of fluid extract and tincture of nux vomica were now taken at random and assayed in similar manner as before described, first in accordance with the U. S. P. IX to determine total alkaloid, and the final solution after titration, was shaken out with chloroform and the strychnine determined according to U. S. P. VIII with the following results:

FLUID EXTRACT: U. S. P. VIII = 1 per cent. strychnine.
U. S. P. IX = 2.37–2.63 per cent. total alkaloids.

Sample.	Total Alkaloid Method U. S. P. IX.	Strychnine Method U. S. P. VIII.	Brucine by Difference
A	2.46%	.79%	1.67%
B	2.64	1.27	1.37
C	2.51	1.03	1.48
D	2.39	.91	1.48
E	2.41	1.21	1.20
F	2.48	.77	1.71

EXTRACT: U. S. P. VIII = 5 per cent. strychnine.
U. S. P. IX = 15.2–16.8 per cent. total alkaloids.

Sample.	Total Alkaloid Method U. S. P. IX.	Strychnine Method U. S. P. VIII.	Brucine by Difference
A	15.41%	4.93%	10.48%
B	16.32	6.69	9.63
C	14.89	5.21	9.68
D	17.1	8.21	8.89
E	15.61	6.71	8.9
F	16.45	6.01	10.44

TINCTURE: U. S. P. VIII = 0.1 per cent. strychnine.
U. S. P. IX = 0.237–0.263 per cent. total alkaloids.

Sample.	Total Alkaloid Method U. S. P. IX.	Strychnine Method U. S. P. VIII.	Brucine by Difference.
A	0.241%	0.111%	0.130%
B	0.271	0.084	0.187
C	0.213	0.079	0.134
D	0.224	0.114	0.110
E	0.251	0.080	0.171
F	0.249	0.102	0.147

Again the results show that there is absolutely no relation between the percentage of total alkaloid and that of strychnine and some of the samples while meeting the requirements of our present Pharmacopœia show a decided deficiency in strychnine content as required by the U. S. P. VIII.

The question therefore suggests itself whether it would not be better to have both a requirement for total alkaloid and for strychnine. Considering the results obtained from the powdered nux vomica, sample C contained 2.52 per cent. total alkaloid and yet is of decidedly inferior quality since it only contains 0.73 per cent. strychnine. On the other hand sample I contains 1.26 per cent. strychnine but only 2.38 per cent. of total alkaloids therefore also of inferior quality. In the opinion of the author no difficulty would be had in obtaining nux vomica on the market, which contains at least 2.5 per cent. total alkaloids and 1.25 per cent. of strychnine. The combination assay process as suggested before could be used thereby requiring only one sample for the entire assay and making it little more difficult and complex than the assay of the U. S. P. IX.

A NEW AND NOVEL METHOD OF DETERMINING THE AMOUNT OF METHYL ALCOHOL IN MIXTURES OF ETHYL AND METHYL ALCOHOL.[1]

By William G. Toplis.

Several years ago, a company was formed in Philadelphia for the production of denatured alcohol, by a process that held certain advantages in economy of manufacture, on the one hand and, upon the other, freedom from domination by the trusts producing wood alcohol. The company, among whose stockholders were five Philadelphia druggists, devoted much time and great efforts to make a going concern of this enterprise. Opposition appeared in several quarters, of which the most important was that in the office of the Commissioner of Internal Revenue. It developed that the proposed process was in conflict with certain inflexible rules for the conduct of fermentation industries, and one particularly serious objection was set forth as follows in the exact wording of the then Commisisoner of Internal Revenue, R. E. Cabell: "The matter of standardizing the product or permitting it to pass into common use without analysis of every part of it, which is a slow and expensive process has already been called to your attention." This meant that we must discover some ready process for determining the amount of methyl alcohol in the mixture of ethyl and methyl, and the said process must be rapid, inexpensive and capable of operation by one of ordinary intelligence, not a trained chemist. It was an original problem, with several troublesome conditions—that required a radical departure from all familiar paths.

To begin, therefore, let us consider the basic difference between the two alcohols here set forth in graphic formulæ:

mol.	12	Methyl alc.	Ethyl alc.	34 mol.
wt.	16	H	H	16 wt.
Methyl alc. ...	4	H C O H	H C O H	6
	32	H	H C H	46 ethyl alc.
			H	

At a glance these formulæ show that there is considerable more material in the molecule of ethyl alcohol than that of methyl alcohol —at the same time they show but one hydroxyl in each formula.

[1] Presented at the annual meeting of the Pennsylvania Pharmaceutical Association, Wilkesbarre, June, 1918.

It is possible from such a compound to set free the hydrogen of the hydroxyl by replacing it with an easily oxidizable metal such as sodium.

Thirty-two parts by weight of methyl alcohol treated with metallic sodium yield exactly the same weight or volume of gas as would be yielded by forty-six parts of ethyl alcohol under identical conditions. However, if equal weights of the two alcohols are subjected to this treatment, very different weights or volumes of gas are set free and this forms a positive means of differentiating between the two alcohols. The fact is that methyl alcohol yields nearly twice the volume of gas that an equal amount of ethyl alcohol gives.

When methyl and ethyl alcohols are mixed and so treated the yield of gas is exactly in proportion as the alcohols are mixed.

The alcohols must be dehydrated which is accomplished by treating a small portion of alcohol with a very large excess of fused potassium carbonate.

The above statements are true of chemically pure alcohols but commercial varieties have higher alcohols associated with them which also react with sodium and yield gas in a different ratio as their molecular weight varies. This fact operates against this method as a precise laboratory operation, but does not affect its application in the work for which it is designed, namely, to protect the government formula by indicating a minimum. The higher alcohols likely to be present in such mixtures have but one hydroxyl also but their molecular weights are still higher than ethyl alcohol. This would indicate as a deficiency of wood alcohol in any test and require further additions possibly, to make the tested alcohol satisfactory. Acetone which is also present in the denatured alcohol does not react with sodium, as there is no hydroxyl in its composition, its presence however indicates against the test and in favor of the government formula. While such impurities must be mentioned to completely cover the subject, their presence from a practical point of view is almost negligible because of the small percentage present.

Apparatus.—Having grounded our theory in substantial fact, apparatus for carrying it into effect becomes our next consideration. From the preceding remarks it will be learned, first, that we hope to set free hydrogen gas from the mixed alcohols; second, to collect this freed gas; third, to measure the gas; fourth, to carry out these

observations upon a known, previously prepared standard denatured alcohol; fifth, to conduct the same experiments upon an equal volume of the alcohol to be tested, and to compare the result of the unknown with that of the known standard.

To successfully prosecute this plan, we found it necessary to provide two hydrometer jars of at least 1,000 Cc. capacity, two 50 Cc. graduated burettes graduated in 1/10 Cc., two small test-tubes on foot.

The remainder of the apparatus, which is simple, was required to be originated and produced by us, as follows: two perfect corks to fit the small test-tubes on foot, two 10-inch lengths of 1/8-inch thin wall, brass tubing. Perforate the corks and insert one end of each brass tube into the cork perforated for it. Pass the brass tubing entirely through the cork until its end comes even with the cork surface, make a tight joint by sealing with hot fused shellac or sealing wax; upon the opposite end of each of the brass tubes mount a trap that will permit gas to escape, but prevent liquid from entering —and be sure that the trap is not too large in diameter to enter the bore of the graduated burette.

If now the test-tubes are corked with the tubes as described they may be submerged in liquid without risk of any of the liquid passing into the interior—whereas, any gas generated within the test tubes could readily force passage through the brass tube and out through the trap surmounting it, to be finally collected for measurement in the burette, inverted over all.

These are the main requirements, but to operate them accurately it was also found necessary to provide further a weight secured to the foot of the test-tube to sink and stabilize it in the liquid when submerged. Also we adopted as a means for introducing the metallic sodium, a large darning needle with an eye through which passed a length of sewing silk. The silk passed through the brass tube out through the trap—down along the outside of the brass tube where it was secured near the cork by a spring clip, so arranged that it released the thread when the burette was inverted over all and pressed down ready for a reading.

The releasing of the thread permitted the needle to fall into the test tube which contained the alcohol to be tested. The pointed end of the needle carried a piece of metallic sodium in large excess. The needle was weighted to insure prompt action. By this arrangement no action occurred until everything was set and ready for it.

Burettes as produced for other operations need correction in one particular. Unless one end is corked, gas would pass through it. Therefore, secure a sound well-fitting cork which push into the burettes with a rod, until it registers at zero and forms the roof of the collecting cylinder when in operation.

OPERATION.—The gas in this case, like all others, is collected over a fluid. In this instance, however, certain precautions must be observed. We are working with the highly oxidizable metal sodium, this forbids any watery liquid, in addition to the other fact that our alcohol must be anhydrous. This suggests then a hydrocarbon oil as the most appropriate liquid. For the sake of cleanliness and rapid action, the oil should have the lowest viscosity. Therefore, our choice fell upon ordinary gasoline as meeting the conditions best of all.

Both hydrometer jars are filled to a convenient depth with gasoline. Into one of the small test-tubes drop from a pipette six drops of the prepared standard alcohol previously dehydrated. Cork it at once as previously described. Submerge it in the gasoline contained in one of the hydrometer jars. Now fill one of the burettes with gasoline, close it with the operator's thumb, be sure there is no bubble of air. invert the burette and place the end beneath the gasoline in the hydrometer jar, remove the thumb and carefully guide the burette, containing its column of gasoline intact, over the trap and down over the brass tube. When it encounters the spring clip, the silk thread is released, the needle bearing the sodium drops into the alcohol. The reaction begins at once, and the hydrogen forces its way out through the trap, is collected in the burette where it is read in cubic centimeters and fractions thereof.

The unknown alcohol is treated in precisely the same way, using the same number of drops and from the same pipette.

If the reading of the unknown sample is less than that of the standard it is deficient in wood alcohol. If greater, the wood alcohol is in excess of the requirement. If the two operations are conducted side by side, all considerations of temperature, barometric pressure, etc., may be ignored as they are identical in each instance.

Dr. Charles A. Crampton, a former Chief Chemist of the Internal Revenue department, after witnessing a demonstration of this method and apparatus, appeared at a hearing before the Ways and Means Committee and testified that "There is in existence a simple method and apparatus that is capable of proving denatured

alcohol within the government requirement—also Mr. Peter Valear, assistant to the Chief Chemist of the Internal Revenue was detailed by Doctor Adams, the present chief, to witness this method of disclosing the amount of methyl alcohol in mixed alcohols.

The major portion of a day was devoted to trials of the apparatus. The conclusions were that the principle and operation were worthy of consideration. The glass apparatus was thought too fragile. It is interesting to note in this series of tests, the apparatus functioned with such precision that it detected the difference between commercial and C. P. wood alcohol in one of the mixtures prepared by Mr. Valear.

Congress is so occupied with war legislation that less important considerations are deferred. However, we hope to have the privliege of producing low cost denatured alcohol in which denaturing substances will be sufficiently prominent and deterring and permitting smaller additions of costly wood alcohol.

THE MANUFACTURE OF ASPIRIN TABLETS.[1]

By Robert C. White, Phar.D.

In *The Pennsylvania Pharmacist* Volume 1, number 2, under date of April, 1918, I was quite interested in the suggestion number 20 reading, "What has been your experience with the various aspirins, and aspirin tablets, which have been offered by the various American manufacturers."

Being a manufacturer, and consequently thinking along those lines, and having done considerable work from a manufacturing standpoint with regards to aspirin, the thought came to me that perhaps a paper dealing entirely with the manufacturing side of aspirin tablets would be of as much interest as are the various complications and problems arising from the presenting by manufacturers of several different makes of aspirin tablets with regard to merchandising. I, therefore, present for your consideration the following data obtained from investigation of the original aspirin tablets, and those of several prominent American houses without any regard whatever to the content of aspirin from a chemical standponit, but purely

[1] Read before the meeting of the Pennsylvania Pharmaceutical Association, Wilkesbarre, June 27, 1918.

from tests involving the physical operation of making an aspirin tablet. As these tests were made from tablets of different manufacture and as various manufacturers improve their product from time to time—as such improvement becomes possible,—it would be unfair to give the name of the manufacturer in any of the following cases. We will, therefore, in our future consideration designate them by number.

Date—May, 1918.
Samples—No. 1.
Appearance—Poor. *Die*—Satisfactory. *Punch*—Poorly engraved.
Color—Good.
Monogram—Indistinct.
Carrying Qualities—Very poor.
Disintegration—Good.
Disintegrating Agent—Potato starch.
Uniformity of Weight—Poor. *Maximum wt.*—7.3. *Minimum wt.*—4.7.
Excipient—Weak starch paste.
Other Filler—Corn starch.
Lubricants—Oil, none. Talcum
Contamination—None.
Packing—Fair.

Date—May, 1918.
Samples—No. 2. Eastern manufacture.
Appearance—Fair. *Die*—Poor. *Punch*—Plain.
Color—Fair.
Monogram—None.
Carrying Qualities—Good.
Disintegration—Good.
Disintegrating Agent—Potato starch.
Uniformity of Weight—Average good. *Maximum wt.*—6.4. *Minimum wt.*—5.7.
Excipient—Weak gum solution.
Other Filler—Corn starch.
Lubricants—Oil, small amount. Talcum, large quantity.
Contamination—Iron.
Packing—Poor and loose.

Date—June, 1918.
Samples—No. 3. Eastern manufacture.
Appearance—Poor. *Die*—Good. *Punch*—Very poor.
Color—Dark.
Monogram—Poor, engraving worn.
Carrying Qualities—Poor.
Disintegration—Fair.
Disintegrating Agent—Corn starch.

Uniformity of Weight—Poor. *Maximum wt.*—7.7. *Minimum wt.*—5.3.
Excipient—Gelatin solution.
Other Filler—Starch.
Lubricants—Oil, large quantity. Talcum, large quantity.
Contamination—Bad, evidently iron stains.
Packing—Poor.

Date—June, 1918.
Samples—No. 4. Eastern manufacture.
Appearance—Good. *Die*—Good. *Punch*—Plain, good.
Color—Very good.
Monogram—None.
Carrying Qualities—Good.
Disintegration—Good.
Disintegrating Agent—Potato starch.
Uniformity of Weight—Good. *Maximum wt.*—6.2. *Minimum wt.*—5.9.
Excipient—White dextrine.
Other Filler—Potato starch.
Lubricants—Oil, none. Talcum, 1/8 gr.
Contamination—None.
Packing—Good, in glass only.

Date—June, 1918.
Samples—No. 5. Middle West manufacture.
Appearance—Good. *Die*—Good. *Punch*—Plain and good.
Color—Good.
Monogram—None.
Carrying Qualities—Fair.
Disintegration—Fair.
Disintegrating Agent—Potato starch.
Uniformity of Weight—Good. *Maximum wt.*—6.4. *Minimum wt.*—5.7.
Excipient—Evidently tragacanth.
Other Filler—Corn starch.
Lubricants—Oil, small quantity. Talcum, 1/4 gr.
Contamination—None.
Packing—In glass, good.

Date—June, 1918.
Sample—No. 6. Middle West manufacture.
Appearance—Fair. *Die*—Badly worn. *Punch*—Plain and good.
Color—Poor.
Monogram—None.
Carrying Qualities—Good.
Disintegration—Fair.
Disintegrating Agent—Corn starch.
Uniformity of Weight—Poor. *Maximum wt.*—6.6. *Minimum wt.*—5.3.
Excipient—Evidently gelatin; or gelatin and gum acacia.

Other Filler—Corn starch.
Lupbricants—Oil, entirely too much. Talcum, very heavy.
Contamination—With metal apparent.
Packing—Good.

Tablets on account of excessive pressure would not disintegrate speedily enough, yet their fracture was soft.

Date—June, 1918.
Sample—No. 7.

Purchased in a Washington, D. C., drug store. Name of manufacturer could not be obtained, had evidently been heated too long in drying, with apparent contamination. The edges were poor and the tablets quite mottled, as if too dark a shade of talcum had been used.

This sample was so far out-classed by those of other manufacturers that it is of no interest whatever except that it tends to show that very poor workmanship in pharmaceutical products still is practiced.

The manufacture of aspirin tablets may be placed in what is considered by manufacturers the delicate group. Many things coming in contact with aspirin can exercise either physical, or chemical function, and so either contaminate or break down the aspirin content. In the manufacture of any tablet there are several important features to which the manufacturer gives considerable attention. The first desirable thing is to present in tablet form the chemical as nearly in its original condition as is possible. The second important thing is disintegration, though in the case of aspirin this is not vital as it takes, according to various authorities, about forty minutes for aspirin to become decomposed in the gastric fluids (U. S. Dispensatory, 20th edition). The next feature is to have present as little foreign ingredients as is possible. As we know there are many materials such as formin, potassium iodide, sodium chloride, sodium bicarbonate, permanganate of potash, sugar, etc., which if obtained in granular form of the proper size may be compressed without the use of any excipient, or binder, without the presence of any filler, and without the addition of any disintegrating agent whatever. The physical properties of aspirin are such that it is placed in a class of tablets known to some manufacturers, as moist tablets. This class includes such tablets as quinine, acetanilide, etc., or tablets which can never be produced with a glass-like surface. The term moist in this case originated with the appearance of the tablet, which no amount of blowing, or dusting, will make entirely smooth. Such tablets if great pressure is applied are inclined to cap; or on account

of their sticky surface allow small particles to adhere to the punches thus leaving dents in the surface of the tablet. This to the manufacturer is known as "picking," meaning that the punches pick off a small particle, leaving a cavity in the tablet. It will be readily seen from the physical properties of aspirin that it is necessary to have present a binder, or excipient. Sugar has not proven satisfactory for this purpose as sugar itself attracts moisture, and complicates the operating of a compressing machine. It must also be remembered that moisture decomposes aspirin, and its presence in large quantities is highly objectionable, therefore the excipient must be one that can be dried very readily and that, at a low temperature. Glucose, gelatin and tragacanth all fail to answer on account of their sticky and slow drying qualities. Honey would not answer as its tendency is to darken white tablets, and the need of much filler makes it unsuitable. Water alone will not bind properly. Solution of acacia answers fairly well but both starch paste and acacia are lacking in making a fine aspirin tablet. It will, therefore, be found that a weak solution of white dextrine in combination with a filler of starch answers better than any other excipient for producing a mass of aspirin for proper granulation. It might here be explained for the information of the unitiated that except in extremely rare cases it is never possible to compress powders of fine degree, but that granules must be built up from the powder.

Another feature involved in the preparing of an aspirin mass or mixture is that it must not be exposed to contamination from metals. From the samples examined it is evident that some of these have been manufactured in the ordinary iron mixers, or if graniteware containers have been used the surface has not been perfect, and iron has been exposed. If this is not the case the moist mass, before drying, has evidently been forced through a brass, or an iron screen, which has produced contamination, and resultant discoloration. In this particular product the writer has found nothing more satisfactory than the mixing of the aspirin ingredients in a special wooden tub made of maple. The operator may mix the dry ingredients through a properly protected powder mixer, but the addition of the dextrine solution must be made in these wooden tubs, the operator wearing long rubber gloves. Care should be exercised in all cases that the minimum amount of moisture, for the best results to be obtained, shall be strictly adhered to. The finished mass taken

from these wooden tubs should be forced very quickly through perfectly clean and well tinned screens, placed immediately in aluminum trays, and dried in vacuo at a temperature not exceeding 120° F.

It will be found if all these rules are observed that aspirin may be dried in three or four hours. If during this time the aspirin has not been exposed to the air it will be found that the granulation dry and ready for compression is in proper condition to be placed on the presses. No oil should be added in the running of aspirin tablets, unless absolutely necessary, on account of weather conditions. It will be found that though on account of the absence of oil the sides of the tablets will not be bright and polished (due to the moist physical properties of the ingredients as spoken of earlier) the edges will be sufficiently smooth for all purposes; and the absence of the oil (which would in time penetrate the tablet) will permit of a harder tablet.

A minimum amount of pure white talcum not exceeding ⅛ gr. to the tablet must be used as otherwise picking on the surface of the tablet will occur. If the engraving of monogram punches is very fine it will be necessary to increase the amount of talcum in order to prevent the material from sticking in the engraving. It should be borne in mind that talcum is objectionable in all cases and as little as possible should be used.

As speedy disintegration of all tablets is considered essential, a disintegrating agent must be used. Doubtless, known to many, potato starch is the disintegrating agent par excellence as it swells very rapidly and ruptures a tablet very quickly when it is introduced into aqueous solution.

The following criticisms in general might be based on the aspirin tablets at present supplied by all except one or two manufacturers; that many of them are off color, some having unquestionably been subjected to contamination. Corn starch has been used by many in preference to potato starch, the excipient used by some is also too heavy and too slow drying.

The nature of engraving used on such monogram punches as have been operated in making aspirin tablets is not of a proper make to use on tablets of such dusty physical appearance. Others through not using a proper disintegrating agent have compressed the tablets too hard, which makes them too brittle for carrying. In other cases to permit of speedy disintegration insufficient pressure has been applied.

In behalf of the tablets examined, however, the writer would like to state that the disintegration in general has been exceptionally good, the discoloration only moderately bad, and that while the appearance of most of the tablets is poor it is undoubtedly preferable to sacrifice physical appearance for efficacy in all cases and when all is said and done it is quite probable, too, that though these matters are of considerable importance to manufacturers the retail druggist may be in a position to inform us that the public are not sufficiently educated in such details, and may prove to us that the poorest looking tablet is the best seller of all.

SERVICE—THE BEST METHOD FOR INCREASING PRESCRIPTION DISPENSING.[1]

By Robert P. Fischelis and Hugo H. Schaefer.

The prime factor governing the increase of prescription dispensing is undoubtedly service.

The pharmacist who best serves the medical profession through careful conscientious and up-to-date dispensing will be sought out and patronized even though, as Emerson might have said, he built his shop in the wilderness.

What constitutes the right kind of service to the medical profession and how can it be given most effectively? Pharmacy is the handmaiden of medicine and service to the medical profession, implies an expert knowledge of drugs and medical supplies and the ability to apply this knowledge practically to the problems of the day. First, then, to give proper service the pharmacist must be educated and when we refer to education we include not only the regular college course but the annual postgraduate courses, offered to the pharmacist through his state and national associations. To give the right kind of service the pharmacist must be up-to-date and a little in advance of the average physician, dentist and veterinarian if possible, in his knowledge of the newer materia medica products. He should attend meetings of medical associations, where possible, and by all means read at least one medical, dental and veterinary

[1] At the forty-eighth Annual Convention of The New Jersey Pharmaceutical Association this paper was awarded the $25.00 prize offered for the best paper on "How to Increase Prescription Business."

journal. Educating the doctor to depend on the druggist for reliable information regarding drugs is not only practising true pharmacy but it is building business.

No surgeon can be successful without the proper instruments and facilities with which to work and no pharmacist can serve the physician or his community without proper equipment. Under equipment we include first: a stock of reliable drugs, chemicals and biological products, either accurately prepared and standardized by the pharmacist himself or purchased from absolutely reliable sources. The pharmacist who can supply the physician with the things he needs when he needs them, other things being equal, should have no fear of physicians' supply houses or even dispensing doctors. Secondly, under the heading of equipment we should include laboratory facilities. This should embrace apparatus for the more common clinical tests but by all means it must include the necessary apparatus for compounding all common and uncommon prescriptions. In the latter classification we include facilities for filling ampuls, sterilization, making titrations, isotonic solutions, etc.

Many doctors are considered cranks because of their insistence on special kinds of service. These are the men to please, for once they feel satisfied with your service nothing will drive them away from you and they become wonderful assets to your prescription department. Incidentally anyone who can please a crank need have little fear of not pleasing the average man.

Quick service and ability to meet unusual requirements are factors which every doctor appreciates and are producers of confidence. A pharmacist may have the stock, equipment, personality and all the other attributes of a successful prescription dispenser but in order to be successful he must not fail to also adopt modern methods of keeping physicians, dentists and veterinarians informed of the fact that he is in step with the progress of the times. An occasional letter, just as personal as acquaintance with these men permits, is one of the best mediums for keeping in touch with the medical man.

It is very important to bring the professional side of the pharmacy to the front if prescription dispensing is to be increased. Show the medical men that only registered pharmacists compound their prescriptions in your store; show that you follow directions for storing and preserving the drugs and biological products pre-

scribed. If the medical man is a specialist talk to him about his specialty and demonstrate that you know the requirements of his branch of medicine as far as drugs and other supplies are concerned.

Do not overlook the fact that dentists and veterinarians are also prescribers and that they would be greater prescribers if you kept them informed of the service you are able to render.

Remember that the busy doctor sees many patients each day and you can lighten his burdens by informing him that you have some one competent at hand at all times to receive his prescriptions over the telephone.

Coöperate with him as far as possible in limiting the promiscuous renewal of prescriptions. Give him practical pointers on conservation of supplies in these times of need and offer suggestions to improve his prescribing. Needless to say the two things just mentioned must be done very tactfully or they will defeat their purpose.

Having earned the physician's confidence and respect, you have given a large part of the service which must be provided to increase prescription dispensing.

One thing still remains and that is a realization of the fact that your success as well as that of the prescriber depends on the service that is rendered to the sick. When you have gotten the prescriber to the point where he sends all his prescriptions to your store, you must bear in mind that the impression you create on the customer determines the ultimate increase or decrease in your prescription business.

Service to the customer is a subject in itself and should be considered as a separate topic.

The best method of increasing prescription dispensing and the one which underlies all others is service to the medical professions.

CONTRIBUTION TO THE CHEMISTRY OF GOSSYPOL, THE TOXIC PRINCIPLE OF COTTONSEED.[1]

By Frank E. Carruth.

(*Contribution from the Chemical Division of the North Carolina Experiment Station.*)

Gossypol is a peculiar coloring matter present in the cotton plant. Apparently it does not belong to any known class of plant pigments. Its relation to cottonseed poisoning has been shown by Withers and Carruth[2] in separate publications on the subject. At present gossypol is of negative economic value, but it is possible that it may prove useful in the future.

Historical.—The first published work on this substance seems to be by F. Kuhlmann.[3] Kuhlmann was attempting to recover fatty acids from the "degras" or "foots" of cottonseed-oil purification. After distilling off most of the fatty acids by superheated steam, a greenish-blue mass was left behind, from which he obtained a substance later called "cottonseed blue" by dissolving out the fatty acids with naphtha, to which he gave the formula $C_{17}H_{24}O_4$. This substance prepared by Kuhlmann differs considerably from pure gossypol in composition and properties and perhaps consisted of a mixture of gossypol with its oxidation products and fatty acids.

A substance known as "gossypin" has been prepared from the foots of cottonseed oil. This substance is described[4] as a light brown pungent powder and evidently consisted of gossypol with certain odorous impurities. Probably this description is based on the work of J. Longmore[5] who, however, does not give his substance any name.

Under the title of "Cottonseed Oil, Its Coloring Matter and Mucilage," J. Longmore describes the preparation of the coloring matter from crude cotton oil:

[1] Abstract of paper in *The Journal of the American Chemical Society*, April, 1918.

[2] *J. Agr. Research*, 5, 261 (1915); *J. Biol. Chem.*, 32, 245 (1917); *J. Agr. Research*, 12, 83 (1918), and a fourth paper to appear soon.

[3] *Compt. rend.*, 53, 444 (1861).

[4] Cf. Julius Wiesner, "Die Rohstoffe des Pflanzenreiches," 1903, 2d edition, p. 754.

[5] *J. Soc. Chem. Ind.*, 5, 200–6 (1886).

Crude cottonseed oil is of an intense ruby, nearly black color due to its holding in solution a powerful vegetable coloring principle. This latter, according to the results obtained by the author, amounts to 10 to 15 pounds per ton of oil. . . .

This coloring matter has now been isolated by the author with the result of throwing some light on its nature. In the dry state it is a light powder of pungent odor, of a brown earthy color and possesses powerful dyeing properties. A small proportion of it is soluble in water, but the principal bulk dissolves only in alcohol or alkalies. It is quite insoluble in acids.

Longmore employed strong alkalies to salt out the soap in the foots and to keep the gossypol in solution. He isolated the gossypol by adding acid to the alkaline solution. He mentions no further purification and it is evident that his product was very impure.

Finally Marchlewski[6] isolated a crystalline product from the "foots" of cottonseed oil by means of a tedious purification process. He named the crystalline substance gossypol from gossyp(ium-phen)ol. His method of preparation is given in the following translation:

The crude product which was obtained from an English oil manufacturer had already undergone a purification process consisting of the removal of the greater part of accompanying fatty acids in the form of their calcium salts.

It was extracted with ether which dissolved the gossypol, its oxidation products (which give the solution a dark brown, almost black color) and also considerable amounts of impurities. This solution is concentrated. There remains a viscous mass which is added in portions to boiling acetic acid. When solution takes place it is filtered from a small residue and allowed to cool. After some standing a dark brown amorphous mass separates which is again dissolved in acetic acid. After 4 or 5 repetitions one finally obtains microscopic crystals which are dark brown in color, and which represent the still very impure gossypol.

Further purification is best secured as follows: Dissolve the crystalline mass in boiling alcohol and add to the dark brown solution 50 per cent. acetic acid until clouding is noticeable. Then the solution is heated to boiling and filtered. After some standing crystals appear which are considerably lighter than the first product. Repeating this process 5 or 6 times finally yields a beautifully crystallized yellow product. Attempts to obtain the gossypol entirely colorless failed. It seems then that the yellow color is inherent athough this is not considered as established.

Marchlewski's "gossypol" was, no doubt, a substance containing one molecule of acetic acid in loose combination with the phenolic body. This compound with acetic acid will be called for convenience gossypol "acetate," and the phenolic body itself *gossypol.*

[6] *J. prakt. Chem.*, 60, 84–90 (1899).

In a personal communication to the writer, A. G. Perkin states that he had a very large quantity of it in paste form and that Professors Hummel and Knecht carried on experiments in the hope of converting it into a dye of commercial importance but without success. Perkin intended to work with gossypol but refrained when Marchlewski stated that he wished to reserve the subject.

Occurrence.—Gossypol appears to be a constituent of the cotton plant only. It occurs in peculiar glands called "gland dots," "secretion cavities," or "resin glands," which are present in all parts of the plant except the woody tissue. These are 100 to 400 μ in diameter and are readily visible to the eye. They appear to be of lysigenous origin, *i. e.,* formed by disintegration of adjacent cells.[7] The author obtained a crude material from an ether extract of the bark which evidently was chiefly gossypol. It was not obtained crystalline. The glands in the root-bark, leaf, petals and boll as well as those of the seed give with concentrated sulphuric acid a characteristic red color, from which fact it is inferred that gossypol exists in all these. An excellent description of the cross section of the seed, showing situation of the glands, is given in Winton's "Microscopy of Technical Products," p. 365.

A. G. Perkin[8] states that gossypol "is not identical with and does not appear to be allied with the coloring matter of the (cotton) flowers."

Amount Present in Cottonseed.—Analyses of parts of the plant other than the seed have not been made. By two different methods, the amounts of gossypol present in the undried kernels, nearly free from lint and hulls, has been found to be about 0.6 per cent. The highest yield recorded was 0.63 per cent.

Attempts have not been made to study the actual variation in different varieties of the cotton plant, but since all varieties of seed seem to have approximately the same number of glands, it would appear that the gossypol content does not vary to a greater extent than the oil or protein content. Assuming for convenience that 100 Gm. of fresh raw kernels contain 0.6 per cent. gossypol and 33.3 per cent. oil, then the ether extract of this material would contain about three times 0.6 or 1.8 per cent. gossypol. Since extraction

[7] A photomicroscopic study of the formation of these glands has been made by Dr. A. Viehoever and Mr. E. E. Stanford of the Pharmacognosy Laboratory of the Bureau of Chemistry. It is not yet published.

[8] *J. Chem. Soc.,* 75, 825 (1899).

by petroleum ether does not remove gossypol, the residue after extraction by petroleum ether or gasoline would contain about 0.9 per cent. gossypol.

Preparation.—The methods which have been used to isolate gossypol from cottonseed are much simpler than the tedious process by which Marchlewski secured it from the "foots" of cottonseed-oil purification. A crystalline product of high purity is secured directly.

Method 1.—It has been found most convenient to use decorticated cottonseed kernels or "meats" which have been passed through rollers to crush the kernels before they are cooked in the oil mill. The kernels are flattened out and in this condition are easily broken up by sifting into smaller particles. The material is passed through a coarse sieve to remove the greater part of the lint and hulls, and then is extracted with petroleum ether or gasoline. For preparation of considerable amounts of gossypol the kernels may be simply percolated with gasoline to remove the greater part of the oil. The resulting material is dried and extracted with ethyl ether. The extract amounts to 2 to 6 per cent. of the weight of material extracted according to the thoroughness of previous extraction. The concentrated extract is of a dark cherry-red color if fresh kernels have been used or almost black if from older seeds. These "gossypol extracts" contain about 17 per cent. to 50 per cent. gossypol. In one case where very fresh kernels were used a considerable part of the gossypol separated out of the "gossypol extract" on standing as a red crystalline powder. The gossypol may be precipitated in brown amorphous flocks by adding petroleum ether, but better yields, practically quantitative, are secured by treating the gossypol extract with one half to one third its volume of glacial acetic acid. On standing several hours or days, or more quickly by warming in the water bath, most of the gossypol separates as the well-crystallized gossypol "acetate" containing 10.1 per cent. acetic acid of composition. The crystalline paste is then sucked off and washed with small amounts of glacial acetic acid, and then with petroleum ether. For further purification the gossypol acetate thus secured is dissolved in ether and glacial acetic acid—about 10 parts to 1 part of gossypol—is added. The ether is then in part distilled until the gossypol begins to separate readily. By this method the fatty and colored impurities are retained by the solvent, which is not so much the case when Marchlewski's method

using alcohol and aqueous acetic acid is followed. The crystalline product in this case contains uniformly 10.1 per cent. acetic acid, while by Marchlewski's method it tended to vary from 8.5 to 9.6 per cent.

For the preparation of crystalline gossypol from the "acetate" the latter is dissolved in ether and water is added. The ether is distilled, leaving the gossypol as crusts floating on the water which contains all the acetic acid. The free gossypol may then be crystallized from alcohol or other suitable solvent.

Method 1a.—In this method the kernels are not previously extracted with petroleum ether, but with ethyl ether only. The evaporated ether extract is treated with acetic acid and allowed to stand until the gossypol "acetate" separates out. This requires a much longer time than in Method 1. The use of 80 per cent. and 90 per cent. acetic acid is more advantageous than the use of the glacial acid. It was found that 7 parts of 80 per cent. acetic acid per 100 of extract gave larger yields than did 90 per cent. or 100 per cent. acetic acid. Acid weaker than 80 per cent. tends to form a separate layer with the extract. By adding 7 parts per 100, heating to 100° to 115° and then setting aside, the separation of the gossypol "acetate" is hastened. Nevertheless, this is very slowly formed, requiring one to three weeks. The yields are poorer on account of the large mass of oil present but from 50 to 80 per cent. of the gossypol may be obtained if sufficient time is given.

Method 2.—The basis of this method is the insolubility in oil of the salts of gossypol. This principle is applied commercially in removing the gossypol and other coloring matters from crude cottonseed oil. The extracts (cf. Method 1) of cottonseed kernels are shaken with a slight excess of strong aqueous caustic soda. The sodium salt of gossypol and sodium salts of the free fatty acids are formed and pass into the aqueous layer, while the clear yellow oil rises to the top. The alkaline liquor is neutralized with acid which causes the fatty acids and gossypol to separate as a pasty mass. This mass may be treated with hot acetic acid to cause separation of the gossypol. This method is not satisfactory and is almost useless where much free fatty acid is present in the oil, when a "break" into oily and aqueous layers is greatly retarded. Gossypol quickly oxidizes in alkaline solutions exposed to air. This oxidation, however, may be retarded by adding sodium hyposulphite ("hydrosulphite") $Na_2S_2O_4$.

If little free fatty acid is present in the gossypol extract, the amount of gossypol present may be approximated by the use of standard dilute alkali. Ether and other fat solvents are added, if necessary, to destroy emulsions. Phenolphthalein is used as indicator. The color change occurs in the aqueous layer after the formation of the disodium salt of gossypol.

Method 3.—This method involves the use of aniline as a precipitating agent for gossypol. A very slightly soluble compound,[9] apparently the dianiline salt of gossypol, is formed, which separates out of an oily extract on standing as an orange-yellow microcrystalline precipitate. Aniline (about 5 per cent. of the weight of the extract) is added to an ether extract of cottonseed. The mixture is warmed on the water bath and set aside to stand a week or more. If given sufficient time the yield is practically quantitative and the method has been used to estimate[10] the amount of gossypol in extracts of cottonseed products.

The aniline-gossypol compound is filtered out and washed free from oil, etc., with ether, or with a small amount of ether followed by larger amounts of petroleum ether. It may be purified by recrystallization from aniline.

To prepare gossypol from the aniline compound it is dissolved in hot alcoholic potash to decompose it and the aniline is steam-distilled out. The resultant aqueous solution of potassium "gossypolate" is treated with a pinch of sodium hyposulphite ($Na_2S_2O_4$) in order to reduce any of the blue oxidation product which may be formed. The gossypol is then precipitated in amorphous flocks by acidifying. It may be filtered out or removed from the solution by shaking with ether in a separatory funnel. It may be purified according to Method 1.

Molecular Weight of Gossypol.—It was first sought to determine the molecular weight of gossypol by physical methods. Preparations of gossypol recrystallized from alcohol with the addition of 50 per cent. acetic acid were first used. The results with various solvents were not uniform. Thus, while the boiling-point method with ether and acetone indicated a molecular weight of 300 to 350; with alcohol, benzene and carbon tetrachloride, the elevation of the

[9] This compound was discovered by Dr. J. T. Dobbins working in this laboratory in attempts to prepare "B" gossypol.

[10] This method therefore may be used to approximate the relative toxicity of extracts. (See *J. Biol. Chem.*, 32, 87 (1917).)

boiling point was abnormally small, indicating a much greater molecular weight. The freezing-point method with benzene was unreliable, owing to the slight solubility of the substance in cold benzene. These results led to suspecting the presence of solvent of crystallization. This was found to be the case as previously described. Further molecular-weight determinations with the McCoy apparatus of the gossypol freed from acetic acid gave the following results:

(1) Ether as solvent. Gossypol 1.002 G. Ether 17.73 G. Elevation 0.20°. Molecular weight found: 595.

(2) Acetone as solvent. Gossypol 1.008 G. Acetone 25.6 G. Elevation 0.121°. Molecular weight found: 553.

(3) Gossypol "acetate" in ether as solvent. Gossypol "acetate" 0.994 G. Ether 20.0 G. Elevation 0.291. Apparent molecular weight found: 352.

These data indicate that the gossypol "acetate" dissociates in solution into free gossypol and acetic acid, causing the previously mentioned anomalous results.

After it was found that gossypol "acetate" crystallized from ether-acetic acid contained uniformly about 10.1 per cent. acetic acid or somewhat more than that prepared in Marchlewski's way, the latter's method was abandoned. Since the determination of acetic acid is easily and accurately made, the method offers a reliable method for the determination of the molecular weight.

Gossypol "acetate" recrystallized 4 times from ether-glacial acetic acid mixture was dissolved in ether. Warm water was then added and the ether driven off. The water was then separated from the brittle crusts of gossypol which remained, the latter dissolved in ether, and the previous treatment repeated. The water containing the acetic acid was then titrated with alkali using phenoltetrachlorophthalein as indicator.

Subst., (I) 0.5326, (II) 0.5057; Cc. 0.1 *N* NaOH, (I), 8.98, (II) 8.57.
Acetic acid found: (I) 10.12, (II) 10.17.
Acetic acid calc. for:
(1) Mol. wt. 592 $C_{30}H_{28}O_9 \cdot C_2H_4O_2$..... 10.18
(2) Mol. wt. 594 $C_{30}H_{30}O_9 \cdot C_2H_4O_2$..... 10.10

Hence "free" gossypol has a molecular weight of 530 if $C_{30}H_{28}O_9$, or 532 if $C_{30}H_{30}O_9$.

The above values for the molecular weight of gossypol stand in agreement with the values obtained by direct titration of the residual

gossypol after removing the acetic acid of combination. The free gossypol left after removal of the acetic acid in the above determinations was dissolved in alcohol and titrated with alkali, using phenoltetrachlorophthalein as indicator. Since the gossypol solution is yellow the end point is more difficult to detect.

The weights of gossypol used here were found by subtracting the 10.12 per cent. and 10.17 per cent. acetic acid from the weights of the gossypol "acetate" used above.

Subst., (I) 0.4787, (II) 0.4543; Cc. 0.1 *N* NaOH, (I) 17.6, (II) 17.0.

Hence assuming gossypol neutralizes two equivalents of NaOH the values for the molecular weight are (I) 544, (II) 532.

Concordant results were also obtained by titrating weighed amounts of pure gossypol and of gossypol "acetate." The "acetate," as is evident, neutralizes three equivalents of alkali. While gossypol thus behaves as a fairly strong acid, it is not thought that it contains carboxyl groups since the benzoyl and acetyl derivatives are not soluble in cold dilute aqueous alkali. The fact that the disodium salt of gossypol is neutral to phenolphthalein in aqueous solution gives an indication of its relative strength as an organic acid.

Empirical Formula.—The following analytical data give results which agree well with the formulas $C_{30}H_{28}O_9$ or $C_{30}H_{30}O_9$ for gossypol.

ANALYSIS OF GOSSYPOL "ACETATE" FOUR TIMES RECRYSTALLIZED FROM ETHER AND GLACIAL ACETIC ACID.

	Subst.	CO_2.	H_2O.	%C.	%H.
1st Crop of Crystals.					
1	0.2321	0.5547	0.1197	65.16	5.77
2	0.2263	0.5404	0.1197	65.12	5.92
2d Crop of Crystals.					
3	0.2107	0.5013	0.1089	64.89	5.79
4	0.2161	0.5142	0.1072	64.89	5.55
5	0.2182	0.5205	0.1153	65.04	5.91
Calc. for $C_{30}H_{28}O_9.C_2H_4O_2$:				64.84	5.45
Calc. for $C_{30}H_{30}O_9.C_2H_4O_2$:				64.62	5.77
ANALYSES OF OTHER PURE PREPARATIONS OF GOSSYPOL "ACETATE."					
1	0.1943	0.4628	0.0963	64.94	5.55
2	0.2207	0.5257	0.1080	64.97	5.48
3	0.2022	0.4819	0.0989	64.98	5.47

PURE "FREE" GOSSYPOL, PREPARED FROM THE GOSSYPOL "ACETATE" (RECRYSTALLIZED 4 TIMES) BY REMOVAL OF ACETIC ACID AND CRYSTALLIZATION FROM DILUTED ALCOHOL.

1	0.2246	0.5573	0.1097	67.67	5.47
2	0.2381	0.5929	0.1165	67.90	5.48
3	0.2361	0.5861	0.1167	67.70	5.53

FREE GOSSYPOL, EARLIER PREPARATIONS, POSSIBLY LESS PURE.

1	0.1953	0.4878	0.0969	68.11	5.55
2	0.2079	0.5183	0.1032	67.98	5.55
Calc. for $C_{30}H_{28}O_8$:				67.64	5.30
Calc. for $C_{30}H_{30}O_8$:				67.39	5.66

Salts of Gossypol.—Gossypol readily forms salts with alkalies. It dissolves easily in aqueous sodium hydroxide, carbonate and very slowly in bicarbonate and disodium phosphate. Gossypol may be titrated as a dibasic acid with dilute alkali, using phenolphthalein as an indicator. The alkali salts are very soluble in water and alcohol and are extremely sensitive to oxidizing agents. The yellow color of their solution soon turns greenish brown and then slowly to a beautiful blue which in turn gradually disappears. The alkali salts may be precipitated by saturated salt solution and a similar salting out action of the alkali is noted when attempts are made to break up gossypol with fused alkali.

Lime water and baryta water do not dissolve gossypol as readily as do alkali hydroxides, which seems to be due to the lesser solubility of these salts. Neutral salts of the alkaline earths do not precipitate gossypol from its alcoholic solutions, neither do silver mercury or copper salts. Iron sulphate and lead acetate give amorphous brownish and yellow lake-like precipitates, respectively, from alcoholic solutions of gossypol. Gossypol does not readily dissolve in strong or dilute ammonia water. The ammonium salt is probably formed but as an insoluble compound. After warming gossypol with dilute ammonia and cooling, the liquid formed a gelatinous mass, evidently due to the physical properties of the ammonium salt.

Compound of Gossypol with Aniline.—Gossypol dissolves readily in warm aniline with which it combines to form a bright orange-yellow substance,[11] which is possibly the dianiline salt of gossypol

[11] This substance heated to 100° was found to contain 3.97 per cent. nitrogen, which agreed sufficiently well with the 3.90 per cent. required for a substance of the formula $C_{30}H_{30}O_8 \cdot 2C_6H_5NH_2$. This seemed at the time to be

which separates out almost quantitatively on cooling the solvent. It is possible that instead of being a simple aniline salt of gossypol it may be a condensation product of carbonyl groups in gossypol with the amino group of aniline. The substance dissolves in alcoholic potash with a blood-red color which seems to persist for a period longer than one would expect if the alkali immediately replaced the aniline at the acid groups. Both "B" gossypol and "D" gossypol, described later, give similar orange-yellow precipitates.

The insolubility of the aniline compound of gossypol furnishes a method of determining the amount of gossypol in cottonseed products, and therefore a chemical method for determining the relative toxicity of a cottonseed product. These compounds do not dissolve readily in the usual organic solvents but are least soluble in petroleum solvents. Warm aniline dissolves them readily and they separate out in crystalline form on cooling. Alcoholic potash dissolves them with a beautiful red color which, however, disappears after the compound is decomposed by the reagent into gossypol and aniline.

The aniline compound of gossypol was first made by Dr. J. T. Dobbins in this laboratory. It was desired to see if "B" gossypol, which at that time was thought to be the product in cottonseed meal formed from gossypol in the cooking process, could be made without the formation of the black material which accompanies it when gossypol is heated to 180–190°. It was thought by Dr. Dobbins that by heating the gossypol in aniline this could be avoided. It was found, however, that even in boiling aniline the gossypol was not decomposed as in dry heating. On cooling the solvent it was noticed that an orange-yellow crystalline substance was deposited. This interesting compound is not appreciably toxic, probably on

the most plausible explanation of the reaction since gossypol behaves as a fairly strong dibasic acid. Later this analysis was checked by another chemist, who reported 4.35 and 4.38 per cent. nitrogen on the unheated material. This appeared to indicate that aniline was disengaged on heating. I have more recently made analyses of this same preparation and have found 4.61, 4.64, 4.84, 4.70 per cent. nitrogen in the unheated substance. There is no perceptible odor of aniline to this substance. The average of 4.65 per cent. for the three most closely agreeing results agrees better for a compound containing 2 molecules of gossypol to 5 molecules of aniline, $2C_{30}H_{28}O_8 \cdot 5C_6H_5NH_2$, which requires 4.58 per cent. nitrogen. My analyses of the aniline compounds "B" gossypol and "D" gossypol show, respectively, 4.84 per cent. and 4.15 per cent. nitrogen.

account of its extreme insolubility. It passes through the digestive tract unchanged.

Presence of Gossypol as such in Commercial Cottonseed Products.—Examination of a number of cottonseed products with a view to determining the fate of gossypol has given results which are of considerable interest. Very little, if any, gossypol was found in samples of hot pressed meal. In one case a small amount was found where the seed used was very dry. On the other hand in the so-called "cold pressing" process at least three fourths of the gossypol of the seed passed into the oil. Such an oil was found to contain 1.5 per cent. gossypol. On treatment with alkali any gossypol in the crude oil is quantitatively removed and passes into the foots. Since crude oil is always treated with alkali no gossypol or related pigment is ever found in the refined edible oil. Since the non-occurrence of gossypol in hot pressed oil is contrary to what might be expected and since it does not occur in *actually cold pressed* oil it may be well to explain the difference. Actual cold pressure squeezes out the oil from the oil cells without allowing it to dissolve gossypol from the "resin glands." Hence the gossypol remains in the press cake. In the commercial "cold pressing" process the seed is heated to a considerable extent and the material is subjected to a grinding, pulverizing action under great pressure so that the glands are broken up and the contents taken up by the hot oil and removed mostly from the cake.

In the hot pressing process as ordinarily conducted under the moist cooking conditions the gossypol glands are disintegrated by the moisture and stirring and the contents stream out and are spread over the seed tissue, where the gossypol is subjected to oxidizing influences. It is not clear why so little passes into the oil, but perhaps the seed tissue holds the gossypol and its oxidation product—"D" gossypol—much as cloth holds a dye, or possibly some chemical combination may take place.

If rather dry seed is used the gossypol is apparently not so readily converted to this less soluble, less toxic oxidation product but remains in part as such in the meal. Such a meal is more toxic than a properly cooked meal. In these cases gossypol may be extracted with ether and the amount estimated by the aniline method. It is interesting to note that gossypol in crude oil behaves much the same as free fatty acid. This was shown by dissolving some gossy-

pol in neutral cotton oil, after which alkali was required to render the oil again neutral to phenolphthalein.

Thus the presence of a considerable amount of gossypol in crude oil would increase the refining loss. The writer has been informed that commercial "cold-pressed" oil tends to show a smaller refining loss than hot-pressed oil. Provided the same seed were used in each process, the author believes that the reverse would be true, owing to the presence of considerable amounts of gossypol in the crude cold-pressed oil.

WEST RALEIGH, N. C.

HOMATROPINE AND THE VITALI TEST.[1]

BY H. DROOP RICHMOND.

In both the British and the United States Pharmacopœios the Vitali test is given as the means of distinguishing homatropine from atropine, hyoscyamine, or hyoscine. Although the hydrobromide is the only official salt, this test might be presumed to be applicable to other salts of homatropine. In the case of the sulphate, however, a distinct violet color is obtained when 0.01 grm. of homatropine sulphate is evaporated with 5 drops of nitric acid to dryness in a porcelain dish on a water-bath, and a few drops of alcoholic potassium hydroxide are added to the residue.

It was found that when prepared with pure homatropine which did not give a Vitali test, the sulphate yielded a violet coloration, and that addition of the equivalent amount of sulphuric acid to homatropine hybrobromide, or hydrochloride brought out a violet coloration. It would appear, therefore, that the sulphuric acid of the sulphate so intensifies the action of the nitric acid as to produce a result which is not given in the absence of sulphuric acid. It was found that when the alkaloid is separated from the homatropine sulphate and the Vitali test carried out on this instead of on the original salt no violet coloration is obtained, and it appears, therefore, to be necessary to use this modification of the Vitali test as a means of distinguishing between atropine, hyoscyamine, or hyoscine and homatropine, when the sulphate is tested, and the direct result should not be accepted as positive until the test has been repeated on the extracted alkaloid.

[1] From the *Analyst* for May, 1918.

THE MELTING-POINT OF ATROPINE SULPHATE.[1]

By H. Droop Richmond.

In the British Pharmacopœia the melting-point of atropine sulphate is given as from 189° to 190° C.; in the United States Pharmacopœia it is stated that it usually melts between 188° and 191° C., but when anhydrous and free from hyoscyamine it melts between 181° and 183° C. These statements are not in accordance with the fact. The melting-point of atropine sulphate is accurately given by Carr in Allen's "Commercial Organic Analysis," Vol. VI, p. 196, where it is stated that, when dried at 100° C., it melts at 194° C., but the presence of moisture considerably lowers this point.

As a matter of fact, the melting-point has been observed on many occasions to be even slightly above 194° C.

In determining the melting-point of atropine sulphate, it is important that the temperature of the bath shall not be too close to the melting-point as atropine sulphate takes up a small quantity of water very easily, and if immersed in a bath only a few degrees below the melting-point this water is driven off rapidly, but before being so it causes the salt to sinter together and acquire an appearance which may be mistaken for melting, and this will take place within a very few degrees of the temperature of the bath. Shortly after this the salt loses its water, becomes anhydrous, and does not actually melt until the proper temperature has been reached; a false melting-point many degrees low may be easily recorded. If, however, the temperature of the bath is, say, 25° or 30° C. below the melting-point, the water is not driven off so rapidly, and the sintering-point is passed without any marked change, or anything which could be mistaken for the change which takes place at a true melting-point. The statement in the United States Pharmacopœia that when anhydrous and free from hyoscyamine it melts between 181° and 183° C. appears to be untrue, and is probably based on an old statement in a former British Pharmacopœia.

[1] From the *Analyst* for May, 1918.

NON-ALCOHOLIC PURE FLAVORS.[1]

By R. O. Brooks, B.Sc.,

CONSULTING FOOD AND DRUG CHEMIST, NEW YORK CITY (FORMERLY STATE CHEMIST, NEW JERSEY AND PENNSYLVANIA).

About ten years ago, as your first "official chemist," I had the pleasure of reading a paper before one of your first conventions, held in this city.

At that time I appeared as an amateur prophet and after describing the then recent genesis of the "Circular No. 19" flavoring standards, I predicted that they had come to stay for quite a while, that State food inspection laws and officials would adopt them in toto and that the Federal authorities would generally follow them when inspecting extracts and flavors.

Since then, by yearly articles in your official organ I have tried to keep the trade posted as to the new developments in the legal chemistry of flavorings. Now I am making a second appearance before you and while not claiming to be even an amateur prophet, yet I feel that it may be worth while to look ahead a little, again. As prophets are always unrecognized in their own country, or at least seldom taken seriously, I am confident that nothing that I say will cause you any worry.

Now as to some war conditions affecting your business and more particularly some unfair and unwise advantages that are being taken of war conditions, possibly at the expense, partly, of Teutonic paymasters. As you know, the cost of pure alcohol in any form has always been absurdly high and at the same time, just now, prohibition is one of the orders of the day.

I do not want to predict that the sale of alcoholic flavorings will be interdicted in all or even many of our states, yet such a thing is possible and with the continued outcry against the conversion of foodstuffs into alcohol it is possible that sooner or later only the alcohol from wood-sugar fermentation will be available.

If prohibition has come to stay, it is now the psychological moment to take advantage of its crusade among the women and to

[1] Read at Ninth Annual Convention of Flavoring Extract Manufacturers' Association of the United States. Reprinted from the Simmons's *Spice Mill*, July, 1918.

introduce and push the sale of non-alcoholic flavorings. The government would have to revise their general definition of an extract, as the solution of flavoring substances in alcohol, or at least no longer consider "flavor" as synonymous with "extract," or else provide standards for a set of non-alcoholic flavors.

In fact, several government departments have already specified non-alcoholic flavors in their supply contracts; thus the navy use a mixture of dry ground vanilla beans and dry sugar and the Indian reservations call for a solution of lemon oil or orange oil in a fatty oil, such as cottonseed oil or corn oil. Evidently the Indian squaw does not object to a turbid gelatine dessert or a little extra shortening in her cakes.

As to glycerin, it has been used vaguely in an occasional vanilla extract and to a considerable and steadily increasing extent it has been churned up thick with gums and essential oils and oleoresins to form the well-known "tube flavors." However, I understand, from those who are more closely in touch with governmental plans than I am, that the warlike requirements for glycerin will soon result in vigorous restrictions on its use in flavors and pharmaceuticals. Moreover, the present price of glycerin cannot be called moderate; in fact, it costs more than alcohol, while not having the preserving value of the latter.

When citrus extracts were made by actually extracting the oil from the peels, alcohol seemed the natural extracting agent, but nowadays all the essential oils are obtained in another industry and about the only extracting done by the present-day "flavoring extract" maker is the preparation of vanilla extract; and even here we find that many are merely buying and diluting a concentrated extract or oleoresin, made more scientifically and economically by some supply house.

Now I will agree that alcohol is perhaps the best extracting agent for vanilla beans and also that it can be nicely recovered by vacuum distillation, yielding a concentrated extract or even an alcohol-free "oleoresin." I cannot agree, however, that, because we extract the flavoring constituents with alcohol, that we must deliver them to the housewife dissolved in alcohol.

Nor is it necessary to deliver the citral, citronellal, geranic esters, etc., of lemon and orange oils in an alcoholic medium and of course every one knows that the terpenes should be kept out of food flavors and restricted to furniture polishes, etc.

In looking over the field for suitable carriers of food flavors, I was attracted by the coincidence that practically every food that is thus flavored is a sweetened product; in fact, old-style vanilla extract is nearly always sweetened with sugar and, for the navy, as said previously, our careful naval chief specifies a mixture of ground vanilla beans and dry sugar. Seventeen years ago, when I was the so-called "state chemist" in New Jersey, I remember testing a mixture of vanillin crystals and sugar, which may still be on the market. Moreover, I think I have read of mixtures of essential oils and dry sugar being sold for food flavoring.

Custom, however, is a queer thing and the housewife's custom of measuring out a spoonful of liquid flavor is deeply rooted, as the manufacturers of the thick emulsified "tube flavors," which are added by squeezing out a drop, have discovered. Must, however, that liquid be mainly alcohol or can we cater to the W. C. T. U. and the prohibition movement, which is mainly feminine, and supply another suitable fluid carrier of flavor?

Why not kill two birds with one stone and supply both flavor and more or less of the sugar sweetening in liquid form at the same time? Which suggestion brings us a consideration of sugar as carriers of flavor. The difference between this proposition and the soda syrups is that the first refers to a strong flavoring product while the soda syrups are merely a mildly flavored product for direct consumption.

Unfortunately, most of the sugar syrups have a decided flavor of their own (such as maple or cane syrups) or else crystallize out if strong enough to not ferment or ferment if thin enough to not crystallize. In recent years, however, there have appeared on the market at reasonable prices several scientifically prepared flavorless sugar solutions, composed of varying proportions of dextrose, levulose and sucrose (all well-known food sugars) and having varying properties, as concerns crystallizing, sweetening power and viscosity.

Two of them are particularly free from interfering flavor and one of these two I have found to be so carefully regulated in its manufacture and so constant in its composition, viscosity and entire freedom from crystallization that I have used it exclusively in the experimental work I will soon describe and show you samples of. It is called by the manufacturers "Nulomoline TP" and is adver-

tised by the Nulomoline Co. and by W. J. Bush and Co. in a number of trade journals, especially as a glycerin substitute.

Its specific gravity is 1.409 (about 42° to 43° Be.) and as the total sugar content ranges from 78 to 80 per cent., it can not ferment, at the same time it does not crystallize. It can be safely diluted, 3 volumes with 1 volume of water, or some partially concentrated vanilla extract for instance, and still not ferment, being then of about the consistency of maple syrup and pouring freely. With very concentrated vanilla extracts and "oleoresins," the three to one dilution was used, the concentrated extracts being merely thoroughly mixed in (1 volume concentrated extract to 9 volumes of diluted "Nulomoline") by shaking and the "oleoresin" (4 oz. Av. to one gallon diluted "Nulomoline") by rubbing up with some of the carrier and then mixing by shaking.

Of course it can be used in undiluted form and still pour and by emulsifying with enough gum we get the familiar "tube flavor," as it would replace glycerin in such products very effectively.

The vanilla flavors I have made are no more turbid than the frequently turbid alcoholic extracts and in some of them, where the worthless resins have been filtered from the concentrated extract, I have obtained very clear mixtures, as you see. In those made from "oleoresins" the alcohol content is zero, while in others the alcohol ranges from 3 to 4 per cent., which in a spoonful would be a trace. Thus the very interfering odor and flavor of alcohol (especially some grades) are eliminated and all of us may become judges of the flavor of the beans without waiting for a cooking test.

In the essential oil flavors, the housewife has accepted to considerable extent the very thick, turbid "tube flavors," and if a non-alcoholic flavor is to be the order of the day, she will have to get used to a more or less turbid thin emulsion of Nulomoline and essential oil, or else resort to the fatty oil solutions of essential oils, which would at least make her gelatine desserts very turbid.

The 1 per cent. almond oil flavor will be less turbid than a 5 per cent. lemon or orange oil flavor, of course, but even the turbidity of a spoonful of the latter would be lost completely in the food product flavored with it. However, as said previously, the use of whole lemon and orange oils is slowly becoming obsolete. They become turpentine-like soon after leaving the "copper," gradually get worse even in alcoholic solution and are out of question in "tube flavors"

or any emulsified product, which incorporates air and hastens the oxidation of the terpenes. I have prepared emulsions of diluted Nulomoline and 5 per cent. whole lemon oil, with and without the aid of small proportions of gums but I cannot advise the use of whole lemon or orange oil in any emulsified product. Most of my experiments have been made with the true terpeneless lemon and orange oils, approximately 15 times stronger than ordinary lemon or orange oil.

These require the use of less than one half of one per cent. by weight, i. e., one third of a pound of oil to 100 pounds of diluted Nulomoline containing preferably a small proportion of gum arabic or gum tragacanth, although perhaps eggalbumin would do just as well if not better. In adding the small per cent. of powdered gum it is advisable to dissolve it in a fairly large volume of the water used for diluting the Nulomoline, said water having been brought to a boil and the gas turned off and the powdered gum dusted in while stirring.

There are various emulsifying machines on the market, but none of them, I am fairly certain, can surpass the wonderfully efficient machine made by the well-known De Laval Separator Co. and known as the "Emulsor." They also make a very efficient clarifying and filtering machine now used by many up-to-date flavoring extract makers. I owe my thanks to that company, who allowed me the use of their demonstrating laboratory, and to Dr. Alexander, their expert investigator and demonstrator. A speed of 10,000 revolutions per minute is obtained by the "Emulsor," with a capacity (in the 2 hp. belt-driven factory model) approaching 100 gallons per hour.

As said above, I have made these flavors without any gum to aid emulsification and show you a sample which if it shows no separation on long standing, is all that can be desired. It was simply run through the machine twice (which operation requires no watching, by the way) and is really only translucent, not milky. Of course, these citrus oil flavors contain no alcohol at all and we thus get the true flavor, without the interfering effects of strong alcohol.

In the thick "tube flavors," Nulomoline could of course take the place of glycerin, with less tendency to separate, which is one of the weak points in the citrus oil tube flavors as now made.

In closing I would add that I have heard of attempts to emulsify

the oils with water only, using some gum, of course, but I should be afraid of the development of molds or a possible fermentation of the gum solution.

THE VITAMINS.[1]

Among the practical points emphasized by Madsen is that lactating woman must have food rich in vitamins. The lack of them may be responsible for certain pregnancy disturbances, uncontrollable vomiting, distaste for food, etc. As rachitis develops predominantly in the artificially fed, the lack of vitamins in the cow's milk or their destruction by boiling the milk, seems a plausible factor in rachitis. We do not know yet whether the scarlet fever virus, for example, survives moderate pasteurization. If the milk has to be sterilized during an epidemic, provision should always be made for supplying vitamins in some other form, meat juice for young infants; potato puree, or egg yolk for older children. In digestive troubles we must beware of not letting the diet get too poor in vitamins, as a diet that makes little demands on the digestive organs is generally poor in vitamins. Desiccation also destroys vitamins in fruit vegetables, etc. This explains why an antidiarrheic diet keeps the patient so languid. The tea, rice water, etc., are peculiarly poor in vitamins, and special measures are necessary to correct this. A surplus of vitamins reduces the calory demand. Tagaki found that the men in the Japanese fleet gained in weight when the rations were modified to include more vitamins although it represented fewer calores. In the Danish prisons, when the bread ration was reduced and barley porridge given instead, the men gained in weight. Barley is richer in vitamins than rye and wheat.

Madsen warns that a lack of appetite is often the first symptom from a deficit in vitamins. He thinks there is much to suggest that a vitamin deficit is a factor in chlorosis anemia, neurasthenia, vasomotor disturbances, etc. In fevers, convalescence, etc., the necessity for an ample vitamin supply is imperative. It is possible that the mysterious benefit from cod-liver oil may be due to an exceptional vitamin content. The commercial infant foods on the market are

[1] From Ugeskrift for Læger, Copenhagen, April 18, 1918, 80, No. 16, by E. Madsen through *The Journal of the American Medical Association*, June 29, 1918.

completely free from vitamins, and they must be added from some other source. In institutions where the food is cooked in large portions at a time, there is liable to be a deficit in vitamins.

There is no doubt, he adds, that beriberi occurs much more commonly in all countries than has been hitherto appreciated, but it is not recognized, as no one looked for it outside the tropics. The war edema without albuminuria may be a rudimentary form of beriberi. It is possible that this may be true also of many cases of peripheral neuritis and heart weakness. Among the peculiarly vitamin-rich foods he lists butter and cheese, egg yolk, raw meat and fresh meat juice and soup. Steamed meat and fish retain their vitamins better than when boiled. Meat extracts are free from vitamins. In grains they occur in a series with rice at the lowest and barley at the highest point; in rice the vitamin occurs only in the hull, in barley in both hull and kernel. The finer the flour is bolted, the less the proportion of vitamin in it. Legumes and potatoes are rich in vitamins, but they pass mostly into the water in which they are boiled, so this water should be used in the preparation of the food. Dried and cooked vegetables have no vitamins. Fresh fruit is rich in vitamins, and in the acid fruits they seem to be especially thermostable. It is still undecided whether wine and oil contain vitamins.

THE A. PH. A. CONVENTION.

This was held in Chicago, August 13 to August 17 inclusive, and the American Conference of Pharmaceutical Faculties convened on Monday, August 12, holding two sessions. The National Association of Boards of Pharmacy also held session on Monday.

The principal business of the Conference grew out of the recommendation of President Henry Kraemer that means be devised for the classification of drug stores as either professional pharmacies, or commercial drug stores; and that a corresponding classification of the colleges be made. A committee was appointed to study the problem.

The Executive Committee of the Conference reported that the Carnegie Foundation had promised to give early consideration to the request for the investigation of pharmacy schools. The report

of this committee showed also that of the students in pharmacy in the conference schools, 58 per cent. were high school graduates; but these statistics did not include the New York schools which reported the State Pharmacy Certificate for their students, and not amount of secondary education in high school years.

The Fairchild Scholarship Examination Committee reported that the action taken last year at the Indianapolis meeting had converted the Scholarship into a Research Fellowship, and that provision had been made, in conformity with last year's action, to grant the Fairchild Scholarship (or Fellowship) on the following basis:

1. That it be limited to graduates from a pharmacy course desiring to return to college for post-graduate instruction.

2. That it be granted to the candidate best equipped for research work.

3. That this ability be determined on evidence of research work previously performed by the candidate and embodied in a thesis, in a paper published in a pharmaceutical or other scientific journal, or in an unpublished paper, but in the latter case, the certificate of the dean of the college, to the effect that the paper records work performed by the candidate, must be provided.

4. That the documentary evidence with reference to research work performed by the candidate be graded on the basis of 50 credit units; that the candidate's pharmaceutical scholastic record be rated on the basis of 40 credit units, and his non-pharmaceutical scholastic record (above high school grade), at 10 credit units.

The opening session of the American Pharmaceutical Association was held Tuesday evening, April 13, and was well attended. Prof. J. U. Lloyd pronounced a most eloquent invocation, after which President A. R. L. Dohme read his address, an able and interesting one, dealing in the main with the subject of the proposed federation of the various pharmaceutical organizations.

The National Association of Boards of Pharmacy held several interesting sessions, and one joint session with the Conference of Pharmaceutical Faculties. The resolution of special interest was to the effect that steps be taken to determine upon a minimum standard for colleges and for pharmacy courses with the view to recognition of colleges by the National Association of Boards of Pharmacy.

The Executive Committee of the National Drug Trade Conference held a meeting on August 13 and decided to call upon the

proper authorities in Washington, and to urge the creation of a pharmaceutical corps in the Army.

A committee consisting of Dr. A. R. L. Dohme, Mr. Samuel C. Henry, and Mr. Charles M. Woodruff, was appointed to make arrangements for such a meeting, and to gather facts and formulate arguments.

The entertainment included a luncheon, on the Chicago Municipal Pier, given by the Chicago Retail Druggists' Association, and a luncheon in the Congress Hotel, given by the Chicago Veteran Druggists' Association. On both occasions, there were speeches and geniality and good fellowship.

On Wednesday, August 14, the alumni of the various colleges took luncheon together. The following colleges were represented—Philadelphia College of Pharmacy, University of Illinois, Northwestern, New York College of Pharmacy, Massachusetts College of Pharmacy, Maryland College of Pharmacy, and Cleveland College of Pharmacy. Over 100 alumni were present.

The committee on nominations of the American Pharmaceutical Association presented the following names:

For president, L. E. Sayre, L. A. Seltzer, E. N. Gathercoal; for first vice-president, T. J. Bradley, A. H. Clark, W. H. Rudder; for second vice-president, Harry Whitehouse, John Culley, Miss Zada M. Cooper; for third vice-president, Jacob Diner, E. Fullerton Cook, Adolph Umenhofer.

J. W. S.

SUMMARY OF THE PROCEEDINGS OF THE 1918 MEETING OF THE AMERICAN CONFERENCE OF PHARMACEUTICAL FACULTIES AT CHICAGO, ILLINOIS, AUGUST 12–13, 1918.

By Theodore J. Bradley, *Secretary.*

The nineteenth annual meeting of the American Conference of Pharmaceutical Faculties convened at the Congress Hotel, Chicago, on Monday, August 12, 1918, with representatives of twenty-six schools in attendance. Three sessions were held, and, in addition, a joint session with the National Association of Boards of Pharmacy.

Henry Kraemer of the University of Michigan was president of the Conference for 1917–1918 and presided at all sessions of the meeting. In his presidential address he discussed several topics of interest and importance to pharmacy and colleges of pharmacy, the most prominent of which was a strong plea for two distinct classes of drug stores, the commercial and the professional, with corresponding courses in colleges of pharmacy, one preparing for the practice of commercial pharmacy and the other for the practice of professional pharmacy. F. J. Wulling, of Minnesota, read a paper supporting the plea of President Kraemer for two kinds of pharmacies.

After consideration of recommendations made by President Kraemer, the conference adopted the following resolutions:

1. That a special committee of three be appointed by the incoming president to consider and report on the question of the establishment of two distinct classes of pharmacies, namely, the commercial drug store and the professional pharmacy, this committee to work with a corresponding committee of the National Association of Boards of Pharmacy, if such a committee is appointed by that organization.

2. That a committee be appointed by the incoming president to work out methods of presenting the advantages of pharmacy as a calling to high-school students of the country.

3. To continue the agitation for the standardization of degrees granted by colleges of pharmacy.

The report of Secretary-Treasurer T. J. Bradley showed that the conference now has forty-six member schools, and that the finances of the organization are in a prosperous condition, there being a balance of slightly more than a thousand dollars in the treasury, with all bills paid. On recommendation of the secretary-treasurer it was voted to request that the proceedings of the joint session of the conference and the Association of Boards of Pharmacy be published in the *Journal of the American Pharmaceutical Association.*

Chairman J. A. Koch made a report for the Executive Committee, in which it was shown that 58 per cent. of the new students matriculated in 1917 in the colleges of pharmacy of the country were graduates of high schools, or had an equal or better preliminary education, and that the other 42 per cent. of the new matriculants had

completed one to three years of high school work. It was also reported that the Carnegie Foundation has promised to give early attention to the question of the investigation and classification of pharmacy schools in a manner similar to the investigation made of medical schools a few years ago.

The report of the executive committee also dealt with the question of military instruction for students in colleges of pharmacy and this subject was discussed at length. It appears likely that students will be allowed to enlist in a reserve army for military instruction, and it is to be the policy of the government that they be not called for service, except in great emergency, until their college courses are completed, provided that their college work is of satisfactory quality.

The report of the Pharmaceutical Syllabus Committee was presented by W. C. Anderson of New York. This committee reported that the preparation of the third edition of the *Syllabus* is well under way, and the Conference voted to continue its annual contribution of twenty-five dollars towards the expenses of this committee.

Memoirs of the services to pharmaceutical education of men who have passed away during the past year were presented as follows: J. P. Remington, by W. B. Day; Charles Caspari, Jr., by E. F. Kelly; A. B. Huested, by William Mansfield; and J. H. Long, by M. A. Miner.

Reports were received from the nine standing committees and from one special committee, which included matter of much value, which will appear in the annual volume of the proceedings of the conference.

The conference voted to instruct its secretary to communicate to the Surgeon General of the United States Army its belief in the erroneousness of a statement widely published and attributed to an officer in the Surgeon General's office, that there are but eight reputable and worthy schools of pharmacy in the United States.

The officers of the conference elected and installed for the ensuing year are: President, Charles B. Jordan, Purdue University School of Pharmacy, Lafayette, Ind.; Vice-President, William Mansfield, Albany College of Pharmacy, Albany, N. Y.; Secretary-Treasurer, Theodore J. Bradley, Massachusetts College of Pharmacy, Boston; Chairman of the Executive Committee, Julius A. Koch, Pittsburgh College of Pharmacy, Pittsburgh, Pa.

CURRENT LITERATURE.

SCIENTIFIC AND TECHNICAL ABSTRACTS.

USE OF TEXTILE FIBERS IN MICROSCOPIC QUALITATIVE CHEMICAL ANALYSIS.

THE DETECTION OF BORON BY MEANS OF TURMERIC VISCOSE SILK FIBERS.—To obtain the characteristic blue color with turmeric by the addition of alkali after drying down with boric acid, certain difficulties are encountered with ordinary turmeric paper, and the most usual result is a greenish-black coloration. The difficulty may be overcome by using individual fibers, instead of paper, and observing the reaction microscopically. For dyeing the fibers, a 50 per cent. alcoholic alkaline solution is made by boiling 20 Gm. of powdered turmeric with 50 Cc. of alcohol, filtering and adding an equal volume of water and 0.5 to 1.0 Cc. of 10 per cent. sodium hydroxide. The fibers are steeped in this solution, which is then evaporated on the water-bath to a syrup. The fibers are then quickly dipped in 95 per cent. alcohol, pressed between filter-paper, dipped in dilute sulphuric acid, washed and dried. Care must be taken to avoid the presence of unabsorbed turmeric, since this interfers with the formation of the blue color. The delicacy and success of the test are largely influenced by the nature of the fiber employed. Viscose silk gives by far the best color reaction, and flax comes next, but is not nearly so satisfactory. For performing the test, a drop of the solution containing boron is placed on a microscope slide, and acidified with dilute hydrochloric acid to decompose borates. A turmeric fiber about 5 Mm. long is placed in the drop, which is allowed to evaporate completely to dryness, either spontaneously or by very gentle warming. The slide is cooled and the fiber examined under the microscope; a rose or violet-rose color indicates boron, and when a drop of 1 per cent. sodium hydroxide solution is placed on the fiber the color changes to Prussian blue, which gradually turns to violet. Too high a temperature in evaporation, failure to carry it to complete dryness, and too strong a solution of soda, interfere with the success of the test. The presence of hygroscopic salts is objectionable, since they prevent the complete drying of the fiber; large amounts of free phosphoric or silicic acid also introduce dif-

ficulties; any strong bleaching agent, if present, must first be removed. The test should not be performed on a borosilicate glass slide. The test is only valid for free boric acid; without the addition of mineral acid, borates do not respond. The test is sensitive to 1 drop of a $N/10{,}000$ solution of boric acid; 1 drop of a solution containing 0.000025 Mgm. of boron gives a positive result.

THE DETECTION OF THE HEAVY METALS BY MEANS OF ZINC SULPHIDE WOOL FIBERS.—Several natural and artificial fibers were tested as a vehicle for zinc sulphide, but the only fibers which could be caused to absorb sufficient of the reagent for satisfactory use were wool and mohair. The preliminary treatment of the wool fiber is important. The fat is removed by treatment with a mixture of alcohol and ether; the fiber is then swelled by soaking overnight at the room temperature in 1 per cent. sodium hydroxide solution. It is then washed and dipped five or six times alternately in solutions of 10 per cent. zinc acetate and 10 per cent. sodium sulphide the excess liquid being pressed out each time but not washed. After the final dipping the impregnated wool is washed and dried by pressing between filter-papers. The sodium sulphide solution is prepared by passing sulphuretted hydrogen into sodium hydroxide until no precipitate is formed with magnesium chloride. To apply the test, a drop of the solution to be tested is placed on a glass slide and a drop of dilute hydrochloric acid is added. A piece of the treated fiber about 5 Mm. long is introduced and examined under the microscope. The liquid is evaporated to dryness, a drop of dilute ammonia solution is added, and the fiber again examined side by side with a new fiber for detecting slight differences of color by comparison. The color changes are yellow, orange, brown, or black. In acid solution the indications are: Straw-yellow, tin; lemon-yellow, arsenic or cadmium; orange, antimony; reddish-brown, bismuth; brown or yellow-brown, platinum, copper, mercury, antimony (sometimes cobalt, iron, manganese or nickel); black or brown in very dilute solution, silver, lead gold, mercury. With no color in acid solution the fiber may turn brown or yellow-brown in alkaline solution in presence of cobalt, iron, manganese or nickel, but these elements rarely give good reactions. Since the fiber is viewed in transmitted light, a heavy precipitate of yellow or orange color may appear brown or black owing to its density; conversely, a brown or

black precipitate in very dilute form may appear brown or yellow. The zinc sulphide wool fibers are sensitive to 0.001 Mgm. of copper. (E. M. Chamot and H. J. Cole, *Journ. Ind. and Eng. Chem.*, through the *Analyst.*)

FAT FROM RICE HUSKS.—Prior to the war rice husks, containing proportion of bran, were exported from Italy mainly to Switzerland and Germany, where they were bought on the combined content of proteins and fat and used as a fertilizer. The "titre" of the best samples ranged from 24 to 26 per cent., and that of inferior qualities from 15 to 16 per cent. As a rule the husks yield about 6.5 per cent. of crude oil, which frequently contains a high proportion of free fatty acids owing to enzymic action. A specimen of the fat extracted with petroleum spirit had the following characters: Melting-point, 25° to 26° C.; acid value, 90; saponification value, 186; Hehner value, 95.2; iodine value, 99.7; glycerol, 4.95 per cent. and unsaponifiable matter, 3.2 per cent. The oil obtained by expression (at 300 atmos.), however, was a greenish-yellow oil with the following values: sp. gr., 0.918; acid value, 13.8; saponification value, 179.4; Hehner value, 94.3; glycerol, 9.03 per cent.; and unsaponifiable matter, 0.7 per cent. The acidity of the oil varies with the nature of the rice, the season, and the state of preservation. In order to obtain a less acid oil richer in glycerol, it would be necessary to express the husk immediately after separation or to destroy the enzymes by heat. A sample of the press cake had the following composition: Water, 14.60; nitrogen, 2.73; and fat, 8.6 per cent. (F. Garelli, *Annali Chim. Applic.*, 1917, 8, 109–114 through the *Analyst*, April, 1918.)

CORRESPONDENCE.

OCEAN CABLE SIXTY YEARS OLD.

FOUR ATTEMPTS REQUIRED TO GET LINE IN WORKING ORDER.

The first Atlantic cable was completed sixty years ago on August 16. From Trinity Bay, Newfoundland, to Valentia, Ireland, the first words shot through the ocean were:

"Europe and America are united by telegraphy. Glory to God in the Highest; on earth peace, good will toward men."

Four attempts had been made to connect the two continents, but on each occasion the cable parted.

It was the high courage of Cyrus W. Field, Peter Cooper, David Dudley Field and others that carried the project through. Even then the full measure of discouragement had not been reached, for after six weeks of experimenting, in which the line was never opened to the public, it broke down.

At the end of two months the operators were dismissed and telegraphic communication between the United States and England was pronounced dead.

The problems to be solved were numerous, but chief among them was the necessity of constructing a cable that would be strong enough to resist the strain placed upon it and at the same time be flexible and slender enough to be carried on a ship. Then an apparatus had to be devised to pay out the cable.

On the fourth trial the Niagara, the largest ship in the United States Navy, and the Agamemnon, an English warship which had been active in the Crimean War, met in the middle of the ocean, July 29, spliced their sections of the cable, and started for home. The Niagara arrived at Trinity Bay, August 4, and the Agamemnon reached Valentia the next day. By August 16 the line was in working order.

The cable was made up of seven copper wires encased in gutta percha, then wrapped in wax hemp, and this covered by an outer sheath of 126 braided wires. It was 2,500 miles long, weighed a ton to the mile, and cost $1,256,250. The total cost of the project was $1,834,500.

To the Editor of American Journal of Pharmacy:

The above clipping from the *Evening Bulletin,* August 16, brings to mind the article by Professor Kraemer in June number of THE AMERICAN JOURNAL OF PHARMACY, "On Medicinal Plants, Present and Future Supplies," in which he alludes to "the story of Marshall Field and the cable as known to every school boy," as an instance of nerve to carry to completion something almost superhuman to the public mind.

In this case the school boy puts one over on the schoolteacher, if the professor refers to the humorous version of that event in rhyme by John G. Saxe as I presume he does, as it was such a familiar one

"to speak" in those preelocutionary days. Had he lapsed just a fraction of time he would have recalled the title of the "piece," "How Cyrus Laid the Cable" and given Marshall the credit for the other achievement in Chicago.

To Cyrus W. Field, a capitalist of New York City, must be given the glory of the conception of an Atlantic cable and the successful completion of one after ten years of repeated failures at home and abroad.

He won out by his determination that the few real difficulties could be overcome if they would simply keep at the game of getting after them.

This he did with large capital, the best of electrical science and a great amount of good sense. And the thing went to the bottom of the sea to talk around the world and has been doing so for sixty years.

Did Professor Kraemer try a wire-less joker on the Philosophical Society, I wonder?

Raising medicinal plants is a science from beginning to end; trained men must follow it from selection of seed to selection of soil, to culture, harvesting, storing, to mercantile work, to the testing of physiological, chemical and therapeutic values.

So that one feature miltates in a great measure against individual enterprise, but makes life worth while with a cheerful company of "harvesters."

We have all things needful in this great country as Professor Kraemer relates seeds, space, time and money. Are we then so lacking in national sentiment by not "turning the sod" at home, as to be helping the "Hun with his Hyoscyamus" and other things abroad?

I am too old at present to "take up the gun" but am young enough to "hoe the herb" with the other great big healthy, happy, harvesters. Let's get the habit.

JOSEPH CRAWFORD.

THE FAIRCHILD SCHOLARSHIP.

September 2, 1918.

The action taken at the Indianapolis meeting relative to the award of the Fairchild Scholarship for this year is expressed in Recommendation No. 5 of President R. A. Lyman's address, and which reads:

"That it be the sense of the Conference that Mr. Fairchild could render the greatest service to pharmacy by offering the scholarship to a graduate pharmacy student, in order that he might pursue some research problem for one full school year, in the school of his choice; and further, that this scholarship be awarded on the basis of the applicant's scholastic training, his standing as an undegraduate pharmaceutical student and upon his fitness to do research."

The committee to whom the matter of formulating a definite plan for awarding the Fairchild Scholarship was referred consists of H. C. Christensen, chairman, 4149 Vincennes St., Chicago, Ill.; Prof. J. W. Sturmer, 145 N. 10th St., Philadelphia; Dr. George C. Diekman, 115 West 68th St., New York, and Dr. R. A. Lyman, c/o The University of Nebraska, Lincoln, Neb.

The committee has decided that in making the award:

The ability of the candidate to perform research work be given a value of 50 credit units; the pharmaceutical scholastic record a value of 40 credit units; and the non-pharmaceutical scholastic record (above high school grade) a value of 10 credit units.

Further, that the candidate's ability to perform research work be determined upon evidence of research work previously accomplished, and that such evidence may take the form of a thesis presented at a college of pharmacy, or a paper covering research work carried out at a college, but in the latter case it should be accompanied by a certification from the dean that the paper represents the student's individual work. A published paper covering research work performed by the candidate subsequent to his graduation may also be accepted as evidence—at the discretion of the committee.

The committee reports further:

"It is to be clearly understood that this procedure does not necessarily represent the views of the members of this Committee on Examination on the larger problem of the awarding of the scholarship, but is merely a practical plan decided upon the basis laid down at the Indianapolis meeting last year."

Schools or colleges of the American Conference of Pharmaceutical Faculties, therefore having a candidate to present for the Fairchild Scholarship, should at once send his credentials, etc., to Chairman H. C. Christensen, 4149 Vincennes St., Chicago, so as to reach him not later than October 1, in order that the award may be made soon thereafter.

The chairman of the Fairchild Scholarship Committee would also request that the schools and colleges give the matter of the Fairchild Scholarship consideration. As the schools are perhaps most interested it is requested that all schools present their views in writing to Secretary Theodore J. Bradley, of the conference, c/o Massachusetts College of Pharmacy, Boston, Mass., prior to December 1. 1918, with a view to having him lay before the incoming Fairchild Scholarship Committee these expressions, so that this committee can be assured of having all schools interested to the fullest extent when they formulate their plans of award for next year, and with the hope that this will become permanent.

We thank you for giving both these matters your prompt consideration. The first should have immediate attention.

Respectfully,

THE FAIRCHILD SCHOLARSHIP COMMITTEE.